VOLUME VIII NUMBER 3

MADROÑO

A WEST AMERICAN JOURNAL OF BOTANY

Contents

THE GENUS ERIASTRUM AND THE INFLUENCE OF BENTHAM AND GRAY UPON THE PROBLEM OF GENERIC CONFUSION IN POLEMONIACEAE, *Herbert L. Mason* 65

A NEW ARGYTHAMNIA FROM TEXAS, *Victor L. Cory* 91

NOTES ON PACIFIC COAST MARINE ALGAE. III, *E. Yale Dawson* 93

A NEW ASTER FROM YUKON, *Arthur Cronquist* 97

TWO TIOID ASTRAGALUS NOVELTIES FROM THE ROCKY MOUNTAIN REGION, *C. L. Porter* 99

REVIEWS: Jens Clausen, David D. Keck, William M. Hiesey, *Experimental Studies on the Nature of Species. II* (Herbert L. Mason); George Neville Jones, *Flora of Illinois* (Marion Ownbey) 102

Published at North Queen Street and McGovern Avenue,
Lancaster, Pennsylvania

July, 1945

MADROÑO

A WEST AMERICAN JOURNAL OF BOTANY

Entered as second-class matter October 1, 1935, at the post office at Lancaster, Pa., under the act of March 3, 1879.

Established 1916. Published quarterly. Subscription Price $2.50 per year. Completed volumes I to VII inclusive, $35.00; each volume $5.00; single numbers $0.75.

Papers up to 15 or 20 pages are acceptable. Longer contributions may be accepted if the excess costs of printing and illustration are borne by the contributor. Range extensions and similar notes will be published in condensed form with a suitable title under the general heading "Notes and News." Articles may be submitted to any member of the editorial board. Manuscripts may be included in the forthcoming issue provided that the contributor pay the cost of the pages added to the issue to accommodate his article. Reprints of any article are furnished at a cost of 4 pages, 50 copies $4.10; 100 copies $4.50; additional 100's $0.85; 8 pages, 50 copies $5.95; 100 copies $6.60; additional 100's $1.30; 16 pages, 50 copies $8.35; 100 copies $9.35; additional 100's $2.00. Covers, 50 for $2.75; additional covers at $1.65 per hundred. Reprints should be ordered when proofs are returned.

Published at North Queen Street and McGovern Avenue, Lancaster, Pennsylvania, for the

CALIFORNIA BOTANICAL SOCIETY, INC.

President: Lee Bonar, University of California, Berkeley. First Vice-President: David D. Keck, Carnegie Institution of Washington, Stanford University, California. Second Vice-President: Adriance S. Foster, University of California, Berkeley. Secretary: George F. Papenfuss, Department of Botany, University of California, Berkeley. Treasurer: Reed C. Rollins, Natural History Museum, Stanford University, California.

Annual membership dues of the California Botanical Society are $2.50, $2.00 of which is for a year's subscription to Madroño. Dues should be remitted to the Treasurer. General correspondence and applications for membership should be addressed to the Secretary.

THE GENUS ERIASTRUM AND THE INFLUENCE OF BENTHAM AND GRAY UPON THE PROBLEM OF GENERIC CONFUSION IN POLEMONIACEAE

Herbert L. Mason

In the course of preparing the manuscript of the Polemoniaceae for Abrams' Flora of the Pacific Coast States, certain taxonomic problems were encountered whose solution called for discussion and the presentation of facts and evidence to an extent beyond the scope and format of that work. Since the present paper is the first in a series, it is deemed desirable here to discuss the problem of generic concepts in Polemoniaceae as influenced by Bentham and Gray, because this influence has made itself felt on the thinking and action of subsequent botanists in their treatment of the species and genera of this family. This discussion will be incorporated in the treatment of the problem surrounding the nomenclature and generic concept of *Eriastrum* Wooton and Standley.

The name *Eriastrum* was proposed by Wooton and Standley to take the place of *Huegelia*[1] Bentham which is a later homonym of *Huegelia* Reichenbach, a group of plants in the family Umbelliferae, and in lieu of *Welwitschia* Reichenbach, whose later homonym, *Welwitschia* Hooker, is conserved as a genus in Gnetaceae. Since, up until the present paper, only the combination *Eriastrum filifolium* (Nutt.) Woot. and Standl. has been made, it might seem to the point to propose the name *Huegelia* Benth. to the International Committee on Botanical Nomenclature with the recommendation that it be conserved. However, in view of the expressed objectives of *nomina conservanda* and the restrictions governing their recommendation, it seems more fitting that the name *Eriastrum* Woot. and Standl. be adopted. *Huegelia* Benth. was rejected by its author in his later treatment (2, p. 310) of the group. It has never since been generally accepted by authors. In 1848 Lindley (15) described *Huegelia lanata,* an entity herein discussed under *Eriastrum pluriflorum.* Seventy years after Bentham's proposal of *Huegelia,* Howell (10) transferred *Gilia floccosa* Gray to that epithet. Nothing further occurred involving the name *Huegelia* until 1925, when, ninety-two years after its proposal by Bentham, Jepson (11) took it up and made the necessary transfers to meet his interpretations of that date; in 1943 he (12) made additional changes. Meanwhile, three important monographic treatments of the genus had appeared, none of which used the epithet *Huegelia* in the rank of genus. In 1907 Brand (4) included

[1] The spelling *"Hugelia,"* first employed by Bentham (1), was later (3) corrected to read *"Huegelia"* since the genus was named in honor of Baron Charles de Hügel.

Corrected date line: Madroño, Vol. 8, pp. 33–64. June 6, 1945.
Madroño, Vol. 8, pp. 65–104. July 31, 1945.

the group as a subgenus under *Navarretia* and Macbride (16) in 1917 and Craig (5) in 1934 treated it monographically as a subgenus of *Gilia.* Thus *Huegelia* Benth. as a genus did not come into general use within fifty years following its proposal nor had any monographic treatment prior to 1890 used that generic name—two points required by botanical law for names to be conserved. *Huegelia* is, therefore, according to the rules, ineligible for conservation.

Eriastrum is fraught with many vexatious problems that are reflected unhappily in its tangled nomenclature. Originally proposed as distinct by Bentham, *Huegelia* was later rescinded by him to be merged with *Gilia,* then merged with *Navarretia* by Brand, reassigned to *Gilia* by Macbride (16) and returned to its original status as a genus by Jepson. This diversity of treatment does not reflect any particular difficulty inherent in *Eriastrum* but rather the state of confusion in the genera in Polemoniaceae as a whole. The problem is of long standing and results partly from a difficult taxonomic subject but more especially from the respect for eminent authority among contemporary botanists. More specifically, it reflects the influence of George Bentham and Asa Gray on subsequent botanical thought.

In summarizing the predominantly annual species of Polemoniaceae, Bentham (1) aggregated them into seven genera—three of which are now included in *Linanthus;* a fourth, *Huegelia,* now *Eriastrum,* with the exception of one species of *Gilia* which was included; a fifth, *Aegochloa,* now *Navarretia,* in which he included *Leptodactylon pungens;* a sixth, *Gilia,* including three species now in *Linanthus;* and the seventh, *Collomia,* including also two species of *Gilia* and one of *Phlox.* Subsequent collections tended to break down these unnatural generic boundaries of Bentham so in DeCandolle's Prodromus he (2) retained only *Gilia, Navarretia* and *Collomia.* His *Navarretia* replaced *Aegochloa* and he eliminated *Leptodactylon pungens* from it but added *Collomia heterophylla. Collomia,* however, still including only annuals with unequal stamens and solitary ovules, did not include all of the members of the genus as we now know it, but it did still include species now belonging to *Gilia* and to *Phlox.* In Genera Plantarum, Bentham (3) again changed his concepts and merged *Navarretia* with *Gilia,* but he was preceded in this move by Gray as indicated below. His concept of *Collomia* changed only to the extent of allowing more ovules in the locule and of indicating the possibility that some plants might be biennial. Thus this last step accomplished little save giving us two genera involving fourteen more or less unnatural sections where we had had seven more or less unnatural genera to begin with.

Gray's (7) early work was influenced very largely by Bentham and in his first major work on Polemoniaceae he accepted only two genera in the annual group, namely *Gilia* and *Collomia.* In

so doing, Gray may have anticipated Bentham or even suggested the move to him. His comment (7, p. 248) is of interest. "The genera at first sight would appear to be more obviously and strictly limited than they actually prove to be; and, except for certain connecting forms, their number might be properly increased by the severance of one polymorphous genus into several, which, for the want of a little extinction, just fail to establish their characters." It was the connecting forms that disturbed him.

Gray did not approve of Bentham's concept of *Collomia* because the uniovulate character caused Bentham to remove *C. heterophylla* to *Navarretia* and yet retain some uniovulate species in *Gilia*. Gray, therefore, relied solely on the unequally inserted stamens with the result that *Collomia,* according to Gray, included in addition to the annual species properly belonging there, four species of *Gilia* and one of *Phlox*. Gray's treatment of subgenera under *Gilia* was at first not nearly as confused as was that of Bentham. This state of affairs did not remain so for long. Gray's first four subgenera are all now *Linanthus* except *Leptosiphon* in which he included *Gymnosteris;* then came *Leptodactylon* as we recognize it today and *Navarretia* in which he included *Langloisia*. His *Huegelia* is our *Eriastrum*. His remaining four subgenera are all *Gilia* but they indicate a very unnatural grouping of the species. Later, however, he added the perennial species of *Collomia* and a *Polemonium* to his subgenus *Eugilia*. It is not surprising to find also in the supplement to the second edition of the Synoptical Flora of North America that Gray had had enough of *Collomia*. He transferred all of the species to *Gilia* and inserted *Collomia* as a subgenus along with *Courtoisia* to care for the multiovulate collomias. At the same time he transferred some species of *Loeselia* to *Gilia,* in the subgenus *Ipomopsis,* and erected the subgenus *Chaetogilia* to care for *Langloisia*.

From a study of the genera and subgenera of this group of Polemoniaceae as they were developed under Bentham and Gray, it is obvious that at no time did these two men really have a true picture of the inter-relationships of the species with which they were dealing. Certainly we cannot differentiate *Linanthus* from *Gilia* if we do as Bentham did and include part of *Linanthus* in *Gilia*. Likewise, *Collomia* cannot be differentiated from either *Gilia* or *Phlox* or *Navarretia* so long as species of these genera are included in it and so long as some of its species are included in them. The chief difficulty with this shifting of genera to subgenera or sections by Bentham and Gray was that they left the groups constituted much as they had been as genera and little progress resulted. An unnatural genus makes just as poor a subgenus. Their treatment is akin to an ostrich burying his head in the sand. By submerging the genera as subgenera the necessity of differentiating between them was eliminated and, like the ostrich, they did not have to look at the object that annoyed them.

No present-day botanist who would either lump the genera of Polemoniaceae or differentiate them will find any real supporting evidence, on either side, in the work of Bentham or of Gray. These two never did face the real problem. They described species, placed them in unnatural higher categories and, when their categories did not hold up, they hid them away—species and all.

Many subsequent writers have made no attempt to rationalize the diversity in the genus *Gilia* as handed down to us by Bentham and Gray, nor have they attempted to analyze the problems that confronted these two men. Theirs has been a blind faith in eminent authority. To them only one important fact stands out, namely, that the eminent botanists Bentham and Gray overthrew the genera involving the dominantly annual species of Polemoniaceae, therefore these genera have no basis in fact or are so vague as not to warrant separate considerations. These writers are wholly oblivious to the fact that the courses of both Bentham and Gray in this group of plants were dictated by complete and absolute frustration, brought about not by any breach of eminence but rather by an incomplete representation of the family as a whole in their collections. In other words, considering the state of information, botanists were in no position, during the lifetime of Bentham and Gray, to circumscribe genera in Polemoniaceae with any degree of assurance or completeness. Therefore the actions of Bentham and Gray in the matter should not weigh too seriously in our consideration of the problem today.

The predominantly annual species of Polemoniaceae can be divided into natural genera and *Eriastrum* is one of them. In the past, great weight has been placed upon certain key characters in the differentiation of the genera of this group of plants. Use of a particular character has often been inherited from the keys of our predecessors and may date back to early beginnings when only a few species were known or in some cases even from times when the subgenera and genera were very unnatural. Such key characters are often erroneous, as is the stamen character most frequently used to separate *Eriastrum* from *Navarretia.* This has been recently pointed out by Mrs. Sharsmith (18) who adds that thereby the major character separating *Eriastrum* from *Navarretia* is eliminated. Long, sagittate or cordate anthers are frequent in *Eriastrum,* but there are also several species in the genus which have short anthers, a character historically attributed to *Navarretia.* Despite the invalidity of this "key" character, these two genera are none the less distinct from one another. Genera do not stand or fall solely on good or bad key characters. After all, it is the sum total of attributes that characterizes any object, whether it be a hat, a stone, a species, or a genus. It is the sum total of the attributes of the species of *Eriastrum* that gives the genus its character. These attributes may be expressed in terms of form and behavior. We are indeed fortunate when differences

can be stated in precise terms of single characters but differences are none the less important when they must be grouped to give character to the whole.

In general, the less complex, usually simple or simple-pinnate leaves and bracts, the heavy arachnoid lanate pubescence, the less harsh spininess, the simple calyx lobes and the usually large sagittate or cordate anthers clearly characterize *Eriastrum*. None of these characters separately apply to all species of the genus. On the other hand, elaborate and irregularly dissected leaves and bracts, a general spininess, the absence of lanate pubescence and in its place a conspicuous glandulosity, very small, round or elliptic anthers, and often toothed or lobed sepals characterize *Navarretia*. Here again, except for the absence of lanate pubescence, none of these characters alone applies to all the species. By the intangibles, however, that are contributed by the sum total of characters and are included under the general term, "aspect," *Eriastrum* and *Navarretia* are easily and positively distinguishable, so much so, in fact, that one rarely finds them confused in herbaria. There are no intermediate or intergrading species.

Eriastrum Wooton and Standley

Huegelia Bentham, Bot. Reg. 19: *sub* t. 1622. 1833, not *Huegelia* Reichenbach, Consp. 144. 1828. *Welwitschia* Reichenbach, Handb. 194. 1837, not *Welwitschia* Hooker, Gard. Chron. 71: 1862, *nom. cons.* *Eriastrum* Wooton and Standley, Contr. U. S. Nat. Herb. 16: 160. 1913. *Gilia* and *Navarretia* of authors, in part.

Erect annuals or perennials, simple or virgately to paniculately or corymbosely branched. Herbage puberulent to densely arachnoid floccose or lanate. Leaves linear and entire to pinnately toothed or dissected. Flowers sessile in bracteate heads, rarely solitary on slender pedicels. Heads usually enveloped in a dense mat of arachnoid wool, less commonly glandular-puberulent. Calyx deeply cleft into linear, unequal to subequal simple lobes, the sinuses usually over half filled with a hyaline membrane, lobes and membrane often densely arachnoid woolly. Corolla blue or white to yellow, rarely pink, sometimes bicolored, funnelform to subsalverform. Stamens inserted on the base of the corolla throat, or occasionally in or just below sinuses of the corolla lobes, included or exserted. Anthers versatile, often sagittate, sometimes cordate or elliptic. Capsule ellipsoid or obovoid, sometimes conspicuously three-sided, often with the base of the style persistent on the capsule and splitting with the valves. Seeds one to several in each locule, usually mucilaginous when wetted. Greek: *erion,* wool, *aster,* star, in allusion to the woolly plants with star-like flowers.

As herein treated, the genus includes fourteen species confined to Western North America. Type species: *E. filifolium* (Nutt.) Woot. and Standl.

In the treatment of the species comprising this genus, Brand (4) found it difficult to arrive at an absolute separation from *Navarretia,* but he presented a successful key to the subgenera, of which *Huegelia* is one. Except for *Eriastrum luteum* and *E. Wilcoxii,* the rest of the annual species are badly confused by Brand. Craig (5, p. 385), whose generic concepts stemmed from Gray, remonstrated with Brand for " . . . his inclusion of *Hugelia* in *Navarretia,* while at the same time separating both from *Gilia.* . . . " Craig's concept of entities within the genus is excellent and we owe the first real characterization and organization of the problems of the genus to him. Craig's work, with slight modification, is largely followed by Jepson (12) in his treatment of 1943. The treatment of *Eriastrum* herein is a further modification of Craig's concepts. In general, the same entities are recognized, but for reasons outlined herewith several of these entities are placed in a different status.

The general simplicity of the plant in *Eriastrum,* together with its concealing mantle of arachnoid lanate pubescence and small flowers makes the detection of characters difficult. Habit of branching is often useful in differentiating species, but foliage characters are at best trends in a series and not too definite. Flower size and the proportion between the tube, throat and lobes are very good as are also the size of stamens and the relative length of stamen and anther (plate 7). They are small and require careful dissection and measuring. Intergradation through hybridization seems rampant in some groups and wholly lacking in others. Hence observations on this feature are useful in formulating concepts of relationship. It is here felt that there is little to be gained by indiscriminate aggregation into subspecies where clear-cut geographic breaks appear or where there is little or no natural hybridization. The use of the term "intergrade" has been somewhat overworked in *Eriastrum.*

Use of Key

In using the key to the species, care should be taken in determining the position of stamen insertion. Because of conspicuous vascular strands, the filament often appears decurrent on the corolla tube or throat; in some cases this portion may be torn free from the throat thus giving the impression of the filament being longer than it is. This may result in a major error in interpretation. Likewise, in dried specimens, the filaments sometimes adhere to the corolla giving the impression of being adnate. Such

Plate 7. Ideographs of Flowers of Species of Eriastrum. Triangles from bottom to top represent corolla tube, throat and limb respectively; left hand arm represents filament and anther; right hand bar, the sepals. When a given whorl of a flower is irregular, the longest element is represented. The ideographs depict the subspecific entity involving the type of the species. Drawn to scale for length only.

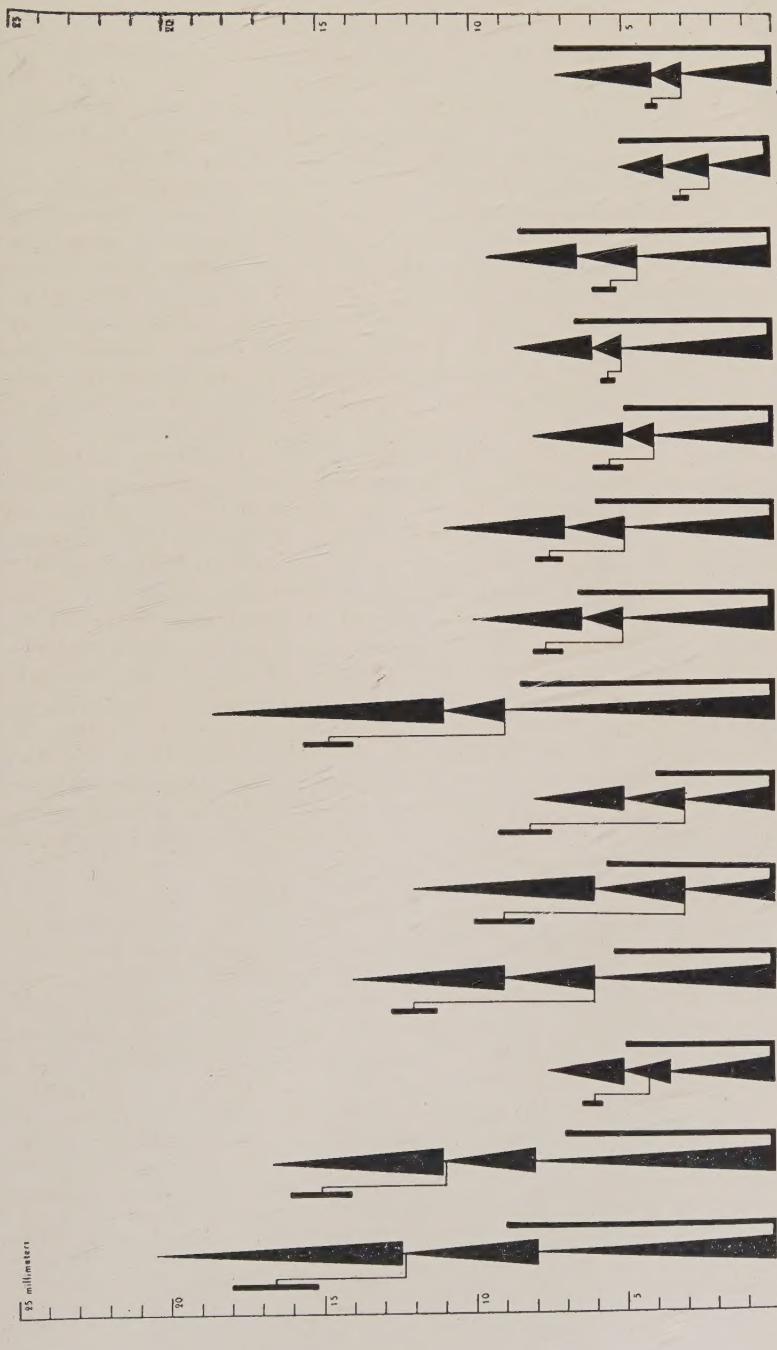

PLATE 7. IDEOGRAPHS OF FLOWERS OF SPECIES OF ERIASTRUM.

difficulties can be eliminated by thoroughly soaking the corolla before attempting dissection. In most Polemoniaceae the corolla is readily divisible into three regions: the tube, which is usually parallel-sided or expands gradually toward the top; the throat, which expands much more abruptly or in some cases may appear to be obsolete; the lobes, which may be regular or irregular. In most species of *Eriastrum* the point of stamen insertion marks the base of the throat and measurements of the throat involve the distance from the stamen insertion to the sinus of the corolla lobes. When the word "tube" is used, it refers to the tube only and does not refer to the combined throat and tube.

In interpreting the mode of branching, it is essential that only larger specimens be used. This is especially true where corymbose branching is indicated. Small specimens are almost always racemosely branched or simple.

Key to the Species of Eriastrum

Plants perennial, woody throughout, or at least from a persistent woody crown; anthers often 3–5 mm. long ..... 1. *E. densifolium*

Plants annual, herbaceous throughout.

Stamens inserted in the sinuses of the petals, corolla 10–20 mm. long, anthers 2–2.5 mm. long ..... 2. *E. pluriflorum*

Stamens inserted at the base of throat or at least well below sinuses.

A. Corolla 8–20 mm. long, the lobes equal or longer than tube, filaments 2 to 4 times throat

Stamens subequal to equal in length, corolla tube 1 to 1½ times calyx; leaves usually simple and entire, lateral pinnae if present, long and filiform.

Corolla 15–20 mm. long, its tube 4 to 6 times throat; bracts all equal or exceeding calyx and sometimes the corolla; corolla regular; hills of Monterey Bay region ..... 7. *E. virgatum*

Corolla 8–15 mm. long, the tube not over 3 times throat, tube shorter than calyx; bracts subequal or shorter than calyx, or 1 or 2 exceeding calyx; corolla slightly irregular, chiefly southern California ..... 5. *E. sapphirinum*

Stamens very unequal in length; corolla irregular, tube 1½ to 2 times calyx; leaves pinnately parted, pinnae rigid ..... 4. *E. eremicum*

AA. Corolla 6–12 mm. long, the lobes conspicuously shorter than tube, regular to slightly irregular

Stems low, diffuse, divaricately branched, glabrous; stamens inserted midway on throat; corolla 6–8 mm. long; deserts ..... 3. *E. diffusum*

Stems virgately, corymbosely or racemosely branched or simple; stamens inserted on base of throat.

Filaments of stamens long exserted.

Stamens 6–8 mm. long, exceeding corolla lobes; corolla golden yellow; seeds solitary in locules ..... 6. *E. luteum*

Stamens 3–4 mm. long, not exceeding the corolla lobes; corolla blue or white, seeds 2 to 4 in a locule ..... 8. *E. filifolium*

Filaments included, sometimes the anther exserted.
Corolla 9–12 mm. long; throat 2 mm. long; anthers exserted; chiefly Great Basin ..... 9. *E. Wilcoxii*
Corolla 4–9 mm. long (if over 9 mm. long the anthers wholly included).
Stamens longer than throat (anther tips exserted).
Branching racemose; corolla longer than calyx; ovules 2 to 4 to a locule; plants 6–30 cm. high; east base of Cascades and Sierra Nevada, Tehachapi Mountains, north to Kings River .. 10. *E. sparsiflorum*
Branching corymbose; corolla shorter than calyx; ovules solitary in locules; plant 3–10 cm. high; anthers very short; central California coast ranges ..... 14. *E. Abramsii*
Stamens shorter than throat.
Corolla 7–10 mm. long, longer than longest sepal; ovules 1 to 2 in a locule.
Branching racemose, stamens 0.75 mm. long; corolla throat 1 mm. long ..... 11. *E. Tracyi*
Branching virgate corymbose; stamens 1.5 mm. long; corolla throat 2 mm. long ..... 12. *E. Brandegeae*
Corolla 4–5 mm. long, subequal longest sepal; ovules several to each locule ..... 13. *E. Hooveri*

1. **Eriastrum densifolium** (Benth.) comb. nov. *Huegelia densifolia* Benth. Bot. Reg. 19: *sub* t, 1622. 1833. *Gilia Huegelia* Steud. Nomen. ed. 2, 1: 683. 1840. *G. densifolia* Benth. in DC. Prodromus 9: 311. 1845. *Navarretia densifolia* Kuntze, Rev. Gen. 2: 433. 1891. *N. densifolia* Brand in Engler, Pflanzenreich 4^{250}: 165. 1907. *Welwitschia densifolia* Tidest. Contr. U. S. Nat. Herb. 25: 429. 1925. *Gilia densifolia* var. *typica* Craig, Bull. Torrey Bot. Club 61: 390. 1934.

Eriastrum densifolium is based upon a Douglas specimen from California that is distinctly shrubby, has thickly set simple linear to occasionally irregularly pinnatifid but not rigid leaves, and corollas 20–25 mm. long. Such plants are known from south of Pismo, San Luis Obispo County.

The variation existing within this species has been adequately reviewed by Jepson (12).

Range. The entity involving the type is confined to the coastal region of California from Morro Bay south to Point Conception where it grows in coastal sand hills.

Representative specimens. "California," *Douglas.* San Luis Obispo County: sand hills 2 miles south of Pismo, *Peirson 2224;* Oso Flaco Lake, *Mason 12474,* Nipomo Mesa, *Mason 12466;* 1 to 3 miles south of Pismo Beach, *Craig 1875.* Santa Barbara County: 3 miles north of Guadalupe, July 3, 1933, *Craig;* Purissima hills, *Mason 412.*

1a. **E. densifolium** subsp. **elongatum** (Benth.) comb. nov. *Huegelia elongata* Benth. Bot. Reg. 19: *sub* t. 1622. 1833. *Gilia elongata* Steud. Nomen. ed. 2, 1: 683. 1840. *Navarretia densifolia* subsp. *elongata* Brand in Engler, Pflanzenreich 4^{250}: 165. 1907. *Gilia densifolia* var. *elongata* Gray ex Brand, *loc. cit.*

This subspecies is based on a Douglas specimen from California not unlike plants growing on the east slopes of the Santa Lucia Mountains in southern Monterey County and in San Benito County. It is less woody than typical *E. densifolium,* the leaves are more rigid and are usually white canescent. It has a very complex genetic and geographic pattern and careful field and genetic study will undoubtedly yield a basis for subdividing it. As at present known, it is not too well differentiated from *E. densifolium* subsp. *austromontanum.*

Range. Monterey and San Benito counties to southern California and Baja California, north in the Sierra Nevada to Inyo County.

Representative specimens. "California," *Douglas* (presumably southern Monterey County). Monterey County: near China Camp, 4200 feet, *Baker 7843;* Tassajara road, 5000 feet (?), *Hall 10077.* San Benito County: 6 miles north of Pinnacles, *Howell 11524.* San Luis Obispo County: coast range north of San Luis Obispo, *Palmer 413.* Los Angeles County: Mint Canyon, *Alexander 850;* Pacoima Wash, *Wolf 1998.*

1b. **E. densifolium** subsp. **austromontanum** (Craig) comb. nov. *Gilia densifolia* var. *austromontana* Craig, Bull. Torrey Bot. Club 61: 391. 1934. *Huegelia densifolia* subsp. *austromontana* Ewan, Bull. Torrey Bot. Club 64: 520. 1937. *H. densifolia* var. *austromontana* Jepson, Fl. Calif. 3: 162. 1943.

This subspecies differs from the above in its more elaborate bracts and more complex leaf pattern, in its lower stature and in being less woolly. It occurs regularly at higher altitudes. Morphological intergradation with subsp. *elongatum* is almost complete and I retain it as separate only with hesitancy.

Range. Higher mountains of southern California and northern Baja California north to Santa Barbara and Inyo counties, California.

Representative specimens. Santa Barbara County: Zaca Peak, 3900 feet, *Axelrod 531.* Inyo County: Onion Valley, *Sharsmith 3259;* Big Pine Creek, 7000 feet, *Alexander & Kellogg 2602.* San Bernardino County: San Bernardino Mountains, Seven Oaks, *Peirson 4127.* Los Angeles County: Rock Creek, San Gabriel Mountains, *Peirson 482.* Riverside County: Santa Rosa Mountains, *Munz 15105;* San Jacinto Mountains, *Munz 5820.* San Diego County: Palomar Mountain, *Pennell & Grant 25927, Chandler 5372;* near Nellie, Palomar Mountains, *Munz 8341* (type).

1c. **E. densifolium** subsp. **mohavensis** (Craig) comb. nov. *Gilia densifolia* var. *mohavensis* Craig, Bull. Torrey Bot. Club 61: 392. 1934. *Huegelia densifolia* var. *mohavensis* Jepson, Fl. Calif. 3: 162. 1943.

The leaves have a broad rachis and short spinescent teeth, the bracts are lanceolate-dentate.

Range. Mohave Desert, San Bernardino to Inyo counties.

Representative specimens. Inyo County: along Bishop Creek, Bishop Park, *Ferris 8970;* Independence, Owens Valley, *Peirson 933.* Kern County: between Rosamond and Mohave, Mohave Desert, *Craig 1360* (type).

1d. **E. densifolium** subsp. **sanctorum** (Milliken) comb. nov. *Gilia densifolia* var. *sanctora* Milkn. Univ. Calif. Publ. Bot. 2: 39. 1904. *Huegelia densifolia* var. *sanctora* Jepson, Man. Fl. Pl. Calif. 792. 1925.

Perhaps one of the most distinct subspecies in *Eriastrum densifolium,* this entity is characterized by its extraordinarily long corolla tube, which is three times the calyx.

Range. Locally developed along the washes and the bordering plains of the Santa Ana River and its tributaries.

Representative specimens. Santa Ana River bottoms, Riverside County: Spanishtown crossing above Riverside, *Hall 173, 683* (type); between Redlands and Highland, *Reed 3107.* San Bernardino County: banks of Santa Ana River, *S. B. & W. F. Parish 1590.*

2. **Eriastrum pluriflorum** (Heller) comb. nov. *Gilia virgata* var. *floribunda* Gray, Proc. Am. Acad. Sci. 8: 272. 1870, not *G. floribunda* Gray. *G. pluriflora* Heller, Muhlenbergia 2: 113. 1906. *Navarretia virgata* var. *floribunda* Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Gilia Brauntonii* Jepson and Mason in Jepson, Fl. Econ. Pl. Calif. 130. 1924. *Huegelia Brauntonii* Jepson, Man. Fl. Pl. Calif. 793. 1925. *H. pluriflora* Ewan, Bull. Torrey Bot. Club 64: 520. 1937.

Range. Hills bordering the San Joaquin Valley, California.

Representative specimens. Contra Costa County: near Brentwood, *Mason 7252.* Alameda County: Corral Hollow, *Brewer 1212.* Stanislaus County: Del Puerto Canyon, *Hoover 3535.* Fresno County: Waltham Creek Canyon, *Eastwood & Howell 5835;* 9 miles south of Kerman, *Hoover 2326.* Kings County: Kettleman Hills, *Hoover 2647.* San Luis Obispo County: 4 miles south of Cholame, *Keck 2800;* 8 miles west of Simmler, *Keck 2808.* Santa Barbara County: 14 miles west of Maricopa, *Mason 12489;* Upper Cuyama Valley, *Munz 11416.* Madera County: 2 miles south of Southfork, *Mason 11956;* Kelshaw Corners, *Constance 234.* Tulare County: South Fork of Kaweah River, *Eastwood 4518;* Middle Tule River, *Purpus 5573.* Kern County: Sunset, *Heller 7734* (type collection of *Gilia pluriflora* Heller); near Oil City, *Heller 7742;* southwest of Woody, *Keck & Stockwell 3318.*

2a. **E. pluriflorum** subsp. **Sherman-Hoytae** (Craig) comb. nov.

Gilia Sherman-Hoytae Craig, Bull. Torrey Bot. Club 61: 415. 1934.

A desert annual, shorter and more tufted than the species; leaf lobes very short, sometimes reduced to teeth; corolla lobes over half as long as broad; stamens 3–4 mm. long.

Range. Centering in the western Mohave Desert.

Representative specimens. Los Angeles County: Lancaster, 1909, *K. Brandegee, Davy 2278;* 10 miles south of Muroc, *Munz & Craig 12925* (type).

Huegelia lanata Lindley (Jour. Hort. Soc. 3: 74. 1848). This is a doubtful species. It is not clear from the literature why no one has been able to ascertain its identity, but since the time of Bentham, *H. lanata* has been questioned by all who have mentioned it. Since in time of war one cannot obtain further evidence, it is necessary to leave it in doubt. A consideration of the description suggests it to be identical with either *Eriastrum pluriflorum* or *E. eremicum.* It is an annual 9 inches tall, leaves 2 inches long with 2 to 3 short segments on either side, bracts recurved, calyx much shorter than corolla tube, anthers long exserted, linear, sagittate, white; plant white lanate throughout. It is reputed to have come originally from Mexico. The relative length of corolla tube and calyx and the number of lateral leaflets I think place it rather definitely in one of the above two species. The recurved bracts suggest *E. eremicum* while the size of plant and leaf would suggest *E. pluriflorum.* The herbage is too white woolly throughout and the leaves too complex for *E. virgatum* as herein interpreted. Should its identity become established its name must probably replace one now in use.

3. Eriastrum diffusum (Gray) comb. nov. *Gilia filifolia* var. *diffusa* Gray, Proc. Am. Acad. Sci. 8: 272. 1870. *Navarretia filifolia* var. *diffusa* Brand in Engler, Pflanzenreich 4^{250}: 167. 1907. *Welwitschia diffusa* Rydb. Fl. Rocky Mountains 688. 1917. *W. filifolia diffusa* Tidestrom, Proc. Biol. Soc. Wash. 48: 42. 1935. *Huegelia diffusa* Jepson, Fl. Calif. 3: 167. 1943.

This is a well-defined species related to *E. eremicum* but differing in the smaller, more regular corollas, the stamens inserted above the base of the throat and the very small anthers. The stamens vary in length from equal to unequal but the former condition is most common.

Range. Throughout the desert regions of the southwest from Utah to Texas, southern California and southern Nevada to Sonora, Mexico and Baja California.

Representative specimens. California. Providence Mountains, May, 1902, *T. S. Brandegee;* New York Mountains, *Alexander & Kellogg 1426;* Little San Bernardino Mountains, *Munz & Johnston 5169;* McCoy Wash, Colorado Desert, *Hall 5965;* Lancaster, May, 1909, *K. Brandegee.* Utah. Milford, *Jones 1788.* Arizona.

Beaver Dam River, *Maguire 4927;* west of Baboquivari Mountains, *Harrison & Kearney 8551.* New Mexico. Mesa west of Organ Mountains, April 23, 1900, *Wooton.* Mexico. Sonora: 10 miles north of Quitovac, *Keck 4138.* Baja California: San Julio, April 19, 1889, *T. S. Brandegee.*

3a. **E. diffusum** subsp. **Jonesii** nom. nov. *Gilia eremica* var. *Yageri* Craig, Bull. Torrey Bot. Club 61: 420. 1934, as to lectotype only, not *G. virgata* var. *Yageri* Jones.

Planta 3–15 cm. alta, diffuse ramulosa, omnino floccosa-lanata; folia simplicia linearia usque ad 3–5 partita; flores in capita compacta, corolla leviter inaequalis, 10–12 mm. longa, lobae coeruleae, tubae albae vel flavae; stamina 2–3 mm. longa, aequa vel inaequalia, circa media faucium inserta; antherae cordatae usque ad ovales, 0.7–1 mm. longae.

Plant 3–15 cm. high, diffusely branched, floccose-lanate throughout; leaves simple linear to 3 to 5 parted; flowers in compact heads, corolla slightly irregular, 10–12 mm. long, lobes blue, tube white or yellow; stamens 2–3 mm. long, equal or unequal, inserted about midway on throat; anthers cordate to oval, 0.7–1 mm. long.

This entity was first diagnosed by Craig (5) under circumstances that led him to believe that he was dealing with the plant diagnosed by Jones and named *G. virgata* var. *Yageri,* an entity herein assigned to subspecific status under *E. eremicum.* It therefore has never had a Latin diagnosis. It differs from the type in the larger corollas and slightly larger anthers and longer filaments. Craig's assignment of this entity to *Gilia eremica* was not without doubt and he pointed out its obvious relationships to *Eriastrum diffusum.* The position of the stamens about halfway on the throat, the small anthers and the nearly regular corollas seem conclusive evidence that it belongs with *E. diffusum* rather than with *E. eremicum.*

Range. Throughout the desert area of Arizona south to Sonora, Mexico.

Representative specimens. Arizona. Pima County: Yager, *Jones 9935* (type); Tucson, *Lemmon 170, 173,* April 3, 1894, *Toumey;* plains west of Santa Catalina Mountains, *Lemmon 241.* Gila County: Pinal Mountains, *Eastwood 17318.*

3b. **E. diffusum** subsp. **Harwoodii** (Craig) comb. nov. *Gilia filifolia* var. *Harwoodii* Craig, Bull. Torrey Bot. Club 61: 424. 1934. *Huegelia diffusa* var. *Harwoodii* Jepson, Fl. Calif. 3: 167. 1943.

It differs from the type in its densely lanate floccose heads and apiculate corolla lobes. The stamens are about midway on the throat.

Range. Eastern Mohave Desert.

Representative specimens. Kern County: Kelso, June, 1915,

K. Brandegee. Riverside County: Blythe Junction, *Munz & Harwood 3589* (type).

4. **Eriastrum eremicum** (Jepson) comb. nov. *Navarretia densifolia* var. *jacumbana* Brand, Ann. Conserv. and Jard. Bot. Genève 15 and 16: 340. 1913. *Huegelia eremica* Jepson, Man. Fl. Pl. Calif. 793. 1925. *Gilia eremica* Craig, Bull. Torrey Bot. Club 61: 416. 1934. *G. eremica* var. *zionis* Craig, *op. cit.* 418. *G. eremica* var. *typica* Craig, *op. cit.* 417.

This is the common bilabiate-flowered type of the desert area of the Southwestern United States. It is exceedingly variable as to degree of zygomorphy of the corolla and leaf complexity. In general there is greater simplicity of the leaf and flower in the eastern portion of its range. *Gilia eremica* var. *zionis* Craig is a form approaching the subspecies below but scarcely warrants subspecific recognition.

Range. Desert area from southeastern California to southern Nevada, Utah and northern Arizona.

Representative specimens. California. Los Angeles County: Mint Canyon, *Peirson 2829;* 12 miles south of Muroc, *Peirson 7268.* San Bernardino County: near Victorville, *Mason 3070;* Daggett, *Hall 6142;* Morongo Valley, *Alexander & Kellogg 2291;* Box "S" Ranch, *Munz & Hitchcock 12772;* Barstow, 1909, *K. Brandegee;* Goffs, *Alexander & Kellogg 1378;* New York Mountains, *Alexander & Kellogg 407.* Riverside County: Van Deventer's, *Hall 1892;* Santa Rosa Mountains, *Munz 15148;* Eagle Mountains, *Alexander & Kellogg 2219;* pass south of Palm Springs, *Munz & Harwood 3526.* San Diego County: Jacumba, *Abrams 3640* (type coll. of *Navarretia densifolia* var. *jacumbana* Brand). Inyo County: Panamint Valley, *Parish 10162.* Nevada. Clark County: Valley of Fire, *Maguire 4929;* 10 miles east of Glendale, *Maguire 4452.* Utah. La Sal Mountains, *Purpus 6521;* La Verkin, *Jones 5194;* Zion National Park, *Boyle 308;* between St. George and Las Vegas, *Goodman & Hitchcock 1665;* Springdale, *Mason 12453.* Arizona. Rim above Quartermaster Canyon, *Grater 15;* Gila River, *A. & R. Nelson 1671;* McDowell Mountain, *Gillespie 5644.*

4a. **E. eremicum** subsp. **Yageri** (Jones) comb. nov. *Gilia virgata* var. *Yageri* Jones, Contr. West. Bot. 13: 2. 1910. *G. eremica* var. *arizonica* Craig, Bull. Torrey Bot. Club 61: 419. 1934. *G. eremica* var. *Yageri* (Jones) Craig, *op. cit.* 420, as to name, not as to lectotype.

It differs from the type in its larger, more nearly regular corollas and its simpler leaves.

Jones, in describing *Gilia virgata* var. *Yageri,* listed several collections belonging to three or four different entities within what is now *Eriastrum eremicum.* Of these he designated *Jones 10279* and *10253* as type, which is not an uncommon practice. Katherine

Brandegee in an unpublished note appended to a scrap of *Jones 10253* in her "study collection" now deposited at the Herbarium of the University of California pointed out, among other things, that *Jones 10279* was so fragmentary as not to be recognizable. Craig (5, p. 421) likewise noted that *Jones 10279* was " . . . so imperfect a specimen as to be impossible of exact reference. . . ." *Jones 10253,* however, was an adequate specimen which Craig designated as the type of his *Gilia eremica* var. *arizonica.* He then discarded *Jones 10279* as the type of his *G. eremica* var. *Yageri,* a name based on *G. virgata* var. *Yageri* Jones. Because the epithet "Yageri" was presumably drawn from the town Yager, in Arizona, Craig next designated *Jones 9935,* collected at Yager, as a lectotype of *G. eremica* var. *Yageri* (Jones) Craig. Had Jones designated no type or had he only designated the inadequate *Jones 10279* as type, this might have been a justifiable and logical procedure. It would seem, however, that in view of the adequacy of *Jones 10253,* it must stand for Jones' concept of *G. virgata* var. *Yageri.* Therefore it seems necessary to place *G. eremica* var. *arizonica* Craig in synonomy under *Eriastrum eremicum* subsp. *Yageri* (Jones) Mason and retain this epithet for the entity typified by *Jones 10253,* as Jones designated it.

Range. Desert region and its borders in Arizona.

Representative specimens. Arizona. Wickenberg, *Jones 10253;* Prescott-Phoenix highway, *Nelson 10263;* Apache trail, *Nelson 10103;* Apache Junction, *Gillespie 5545;* Arizona Strip, *Maguire & Blood 4453;* Peach Springs, *Wilson 145;* Mazatzal Mountains, *A. & R. Nelson 1945;* Welton, *Harrison & Kearney 9141.*

5. **Eriastrum sapphirinum** (Eastwood) comb. nov. *Gilia sapphirina* Eastwood, Bot. Gaz. 38: 71. 1904. *Navarretia virgata* var. *sapphirina* Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Gilia virgata* var. *sapphirina* Macbride, Contr. Gray Herb. 49: 58. 1917. *Huegelia virgata* var. *sapphirina* Jepson, Man. Fl. Pl. Calif. 793. 1925.

Having restricted the epithet, *Eriastrum virgatum,* to those northern plants isolated in the vicinity of Monterey Bay which have long corolla tubes and long bracts, the southern California plants formerly referred to that name must now be known as *E. sapphirinum* (Eastwood) Mason. Corolla tube from subequal to two and one-half times the throat, the bracts are subequal the calyx, rarely with one or two slightly longer, the heads are few-flowered, the calyx and bracts are glandular pubescent, rarely slightly floccose. Variation within the species seems to center around the pubescence of the inflorescence, the length of the bracts, the extent of its hyaline membrane, and the size of the corolla. Variations centering around these characters seem to be aggregated geographically and are treated below. They appear to interbreed completely.

Range. Usually at higher elevations of the mountains of southern California south to Baja California.

Representative specimens. California. Riverside County: Strawberry Valley, San Jacinto Mountains, *Hall 329;* Hemet Valley, *Wilder 959.* San Bernardino County: north base of Sugarloaf Mountain, *Munz 10760;* Bear Valley, *Peirson 8585.* San Diego County: Laguna Mountains, *Wiggins 2821;* Palomar Mountain, *Meyer 489;* Oak Grove, *Peirson 2299.* Los Angeles County: Swartout Canyon, *Hall 298.* Baja California. Fourteen miles southeast of Tecate, *Peirson 5840.*

5a. **E. sapphirinum** subsp. **gymnocephalum** (Brand) comb. nov. *Gilia virgata* subsp. *gymnocephala* Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *G. virgata* var. *oligantha* Brand, *loc. cit.*

The flowers are solitary and pedicelled, rarely in pairs. This represents a type of variation that recurs in many members of the Polemoniaceae. *Gilia multicaulis* and *G. pedunculatis,* and *G. tricolor* and its variety, *longipedicellata,* are similar pairs of variants in the same direction.

Range. San Diego County and northern Baja California.

Representative specimens. California. San Diego County: Granite, *Spencer 68;* near Viejas, June 16, 1906, *K. Brandegee.* Baja California. Santa Catalina Mountains, July 29, 1883, *Orcutt.*

5b. **E. sapphirinum** subsp. **dasyanthum** (Brand) comb. nov. *Navarretia virgata* var. *dasyantha* Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Huegelia virgata* var. *dasyantha* Jepson, Man. Fl. Pl. Calif. 793. 1925. *Gilia virgata* var. *dasyantha* Craig, Bull. Torrey Bot. Club 61: 395. 1934.

Range. Lower and moderate altitudes of southern California and Baja California and perhaps ranging into the hills bordering the San Joaquin Valley where it is represented by two collections with doubtful data, one by Lemmon and the other by Mrs. Brandegee.

Representative specimens. California. Los Angeles County: Verdugo Canyon, *Ewan 3641;* Mandeville Canyon, *Clokey & Templeton 4549;* Monrovia Canyon, *Howell 3879;* Little Tujunga Wash, *Wolf 2262;* San Dimas Wash, *Wheeler 860;* Claremont, *Baker 3345.* San Bernardino County: San Bernardino Valley, *Parish 11282;* plains north of San Bernardino, *Parish 11888;* San Gorgonio Wash, June, 1933, *Epling & Robison.* Riverside County: Riverside, July, 1897, *Hall;* Rubidoux, *Condit;* Wilder's near Riverside, *Wilder 45.* San Diego County: grade above Rincon, *Wiggins 3087.* Baja California. Five miles south of San Tomas, *Pennell & Epling 25231;* Hanson's Ranch, July, 1884, *Orcutt.*

5c. **E. sapphirinum** subsp. **ambiguum** (Jones) comb. nov. *Gilia*

floccosa var. *ambigua* Jones, Contr. West. Bot. 13: 2. 1910. *G. virgata* var. *ambigua* Craig, Bull. Torrey Bot. Club 61: 412. 1934. *Huegelia virgata* var. *ambigua* Jepson, Fl. Calif. 3: 165. 1943.

This is a desert and desert border race with broad, short three- to seven-lobed bracts often destitute of any membrane on the margins; flowers in closely compacted small heads. It merges with the species in mountains bordering the deserts. Included here are the southern California plants formerly interpreted as *Huegelia lutea* Benth. or *Gilia lutescens* Steud. These plants are amply distinct from *Eriastrum luteum* of the Santa Lucia Mountains to the north in their numerous small heads and in their consistently short bracts and shorter stamens. The flower color is white or pale yellow or blue rather than the golden yellow of the northern plant. The corolla lobes are longer and the throat shorter. The branching is more open paniculate.

It is a matter of interest to note that Jones cited two collections under his *Gilia floccosa* var. *ambigua,* one of them, the type, being characterized by short bracts; the other specimen, from Bear Valley, has several of the bracts exceeding the calyces and is more properly referred to subsp. *dasyantha.* Jones' type was immature but it compares favorably with the Keck and Stockwell, and Alexander and Kellogg collections cited below.

Range. Desert slopes of the mountains of southern California.

Representative specimens. San Bernardino County: near Victor (now Victorville), *Jones 10011* (type); 7 miles west of Victorville, *Keck & Stockwell 3300;* south of Victorville, *Alexander & Kellogg 2302;* Mojave River district, *Palmer 405.* Los Angeles County: Lancaster, June, 1888, *K. Brandegee;* Ravenna, June, 1910, *K. Brandegee.* Riverside County: Santiago Peak, *Munz 7103;* Temescal Canyon, *Peirson 4708;* San Jacinto Canyon, June, 1910, *Condit.*

6. **Eriastrum luteum** (Bentham) comb. nov. *Huegelia lutea* Benth. Bot. Reg. 19: *sub* t. 1622. 1833, not *Gilia lutea* Steud. *Gilia lutescens* Steud. Nomen. ed. 2, 1: 684. 1840. *Navarretia floccosa* Kuntze, Rev. Gen. 2: 433. 1891, in part. *N. lutescens* Kuntze, *loc. cit. N. lutea* Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Gilia floccosa* Gray, Proc. Am. Acad. Sci. 8: 272. 1873 (in part). *Navarretia floccosa* Kuntze, Rev. Gen. 2: 433. 1891.

The following only as to type, not as to text.

Huegelia floccosa (Gray) Howell, Fl. N.W. Am. 458. 1903. *Gilia virgata* var. *floccosa* (Gray) Milkn. Univ. Calif. Publ. Bot. 2: 40. 1904. *Navarretia virgata* subsp. *floccosa* (Gray) Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Welwitschia floccosa* (Gray) Rydb. Fl. Rocky Mountains 688. 1917. *Huegelia virgata* var. *floccosa* (Gray) Jepson, Man. Fl. Pl. Calif. 793. 1925. *H. filifolia* var. *floccosa* (Gray) Jepson, Fl. Calif. 3: 166. 1943 (excluding lectotype).

The southern California references to *Eriastrum luteum* by previous authors are here included in *E. sapphirinum* subsp. *ambiguum* (Jones) Mason and reasons are given in the account of that subspecies. *Eriastrum luteum,* being based upon *Huegelia lutea* Benth., has as its type a Douglas specimen from "California." A remarkably close match for the Douglas plants is a collection by Brandegee from near Jolon, a town very close to Mission San Antonio, and along the route of Douglas on his southward overland journey from Monterey.

Range. Santa Lucia Mountains of Monterey and San Luis Obispo counties, California.

Representative specimens. "California," *Douglas.* Monterey County: Jolon, June, 1909, July, 1910, *K. Brandegee, T. S. Brandegee,* Herb. Univ. Calif. no. 84336. San Luis Obispo County: mountains north of San Luis Obispo, June, 1878, *Lemmon;* $\frac{3}{4}$ mile west southwest of Highland School (Poso Quadrangle), *Hendrix 232;* 2 miles west of Lime Mountain (Adelaida Quadrangle), *Nordstrom 1353.*

In the above synonymy, the names listed in the second part are all based on *Gilia floccosa* Gray as to type. Most of the authors of combinations, however, were discussing *Eriastrum Wilcoxii* in the text, having been misled by Gray's misuse of the epithet, *Gilia floccosa,* in his later publications. When Gray originally named *G. floccosa,* he was obviously intending only to apply a new name to *G. lutescens* Steud., a name based on *Huegelia lutea* Benth. Gray (7, p. 272) believed that Bentham had erred in assuming the color of *H. lutea* to be yellow and expressed himself as follows, "Flowers blue or pale purple, becoming white only in age, and though appearing yellowish in original dried specimens of Douglas, probably never yellow. Hence a new specific name is required." This quotation clearly indicates Gray's purpose and intent. Although the only specimens mentioned by Gray in his description of *Gilia floccosa* are " . . . the original dried specimens of Douglas . . ." which are coast range plants, it is probable that his concepts of flower color were based largely upon transmontane plants. But if one would argue that *G. floccosa* Gray constituted an original name with a validly published description, as has been recently suggested by Jepson (12), the Douglas specimen must then be regarded as its type. Some time prior to the publication of the Synoptical Flora of North America, Gray received a specimen which he cited in that work (8, p. 143) under *Gilia lutescens* as follows, "Back of San Simeon, *Palmer,* confirming the yellow color of the corolla." Through this collection, Gray became aware that Bentham's name, *Huegelia lutea,* was after all appropriate, and that in changing it to *Gilia lutescens* upon finding *G. lutea* preoccupied, Steudel (19) was justified in selecting a name descriptive of the yellow color. Gray, however, persisted in retaining the name, *G. floccosa,* for the transmontane plants,

excluding from it *Huegelia lutea* Benth. and its synonym, *Gilia lutescens* Steud. Thus, in effect, Gray redescribed *G. floccosa* to embrace the blue-flowered plants and excluded from it "the original dried specimens of Douglas" or, if you will, the type specimen upon which it was originally based.

Gray preempted for this species an epithet from a specimen in Nuttall's herbarium named *Huegelia floccosa* Nutt., which to Gray was a *nomen dubium* since the specimen was unidentifiable. The combination *H. floccosa* Nutt., published by Gray, is both a *nomen dubium* and a *nomen nudum* but not a true synonym of *Gilia floccosa* Gray.

When he first published *Gilia floccosa,* Gray (7, p. 272) cited the range as "California to Arizona, interior of Oregon, and Utah," without any differentiation between transmontane and cismontane California. In publishing the reconstituted species, however, he (8, p. 143) clearly differentiated between the southern and eastern part of the state and the remainder of California as follows: "Dry plains and desert, southern and eastern portions of California and S.E. Oregon to Utah and Arizona." Thus with the original description he had included the range of *Gilia lutescens* and it is clear that he intended, by qualifying the habitat, to exclude it in his later treatment.

It seems necessary to go into this detail because of an argument raised by Jepson (12, p. 166) in behalf of *G. floccosa* Gray. Jepson maintains that since Gray's original description and citation of range applies mainly if not wholly to transmontane plants, and since Gray continued to so apply the name *G. floccosa* in subsequent publications, therefore he was not dealing with the same entity named *Huegelia lutea* by Bentham; that because of Gray's "wrongly citing the name of a different and valid species as a synonym" (*H. lutea* Benth.) this cannot invalidate a name with a properly published description; and finally, that Gray used " . . . slightly qualifying phrases which indicate shadows of doubt" in citing *H. lutea* Benth. as a synonym.

That Gray was referring not only to transmontane plants in his original description of *Gilia floccosa* will be clear from the above outline of the case. It should be obvious also that the original *G. floccosa* Gray is inseparably attached to "the original dried specimens of Douglas" from which it cannot legally be detached. It, therefore, should also be clear that Gray was not wrong in citing *Huegelia lutea* Benth. and *Gilia lutescens* Steud. as synonyms, but rather in bestowing the name *G. floccosa* upon a detached entity not involving the type of *G. floccosa.* Gray's action may have been good taxonomic practice at that time, but today our rules do not permit it and demand correction of such errors. And finally, a reading of Gray's original description and attendant discussion will make it amply clear that Gray used no qualifying words or phrases of any kind in citing *Huegelia lutea* Benth. in

synonymy. His doubts concerned only the color of the flower of the Douglas specimen, and the identity of the herbarium name, *Huegelia floccosa* Nutt.

7. **Eriastrum virgatum** (Benth.) comb. nov. *Huegelia virgata* Benth. Bot. Reg. 19: *sub* t. 1622. 1833. *Gilia virgata* Steud. Nomen. ed. 2, 1: 684. 1840. *Navarretia virgata* Kuntze, Rev. Gen. 2: 433. 1891. *N. virgata* Brand in Engler, Pflanzenreich 4^{250}: 167. 1907. *N. densifolia* var. *lanata* Brand, *op. cit.* 165. *Gilia virgata* var. *typica* Craig, Bull. Torrey Bot. Club 61: 394. 1934.

Its very long corolla tube, strictly regular corolla, very long bracts and its geographic isolation are distinctive.

Range. Sand hills and mesas, in the vicinity of Monterey Bay, from Pajaro hills to Carmel River Canyon.

Representative specimens. "California" (Monterey), *Douglas;* Monterey, *Brewer 642;* Carmel River Canyon, *Mason 541;* Seaside, *Heller 6753* (type of *Navarretia densifolia* var. *lanata* Brand); Pajaro hills, *Chandler 454.*

8. Eriastrum filifolium (Nutt.) Wooton and Standley, Contr. U. S. Nat. Herb. 16: 160. 1913. *Gilia filifolia* Nutt. Jour. Acad. Nat. Sci. Phila. n.s. 1: 156. 1848. *Navarretia filifolia* Kuntze, Rev. Gen. 2: 433. 1891. *Gilia virgata* var. *filifolia* Milkn. Univ. Calif. Publ. Bot. 2: 39. 1904. *Navarretia filifolia* subsp. *eufilifolia* Brand in Engler, Pflanzenreich 4^{250}: 167. 1907. *Gilia floccosa* var. *filifolia* Nels. and Macbr. Bot. Gaz. 61: 35. 1916. *Welwitschia filifolia* Rydb. Fl. Rocky Mountains 688. 1917. *Huegelia filifolia* Jepson, Man. Fl. Pl. Calif. 792. 1925. *Gilia filifolia* var. *typica* Craig, Bull. Torrey Bot. Club 61: 422. 1934.

Eriastrum filifolium is herein confined to plants of coastal southern California and Baja California, that is, plants of the hills, valleys and mesas on the coastal side of the main mountain crests. The exclusion of *E. sparsiflorum* (Eastw.) Mason and *E. Wilcoxii* (Nels.) Mason treated under various epithets in minor categories under this species by authors, is here based upon the slender filiform leaves, the very long, exserted filaments, the nature of the pubescence, the corolla proportions, the very long and narrow capsule, and the geographic isolation. The type of *E. filifolium* was collected near Santa Barbara by Nuttall. This is close to the northern point in its range since the northernmost collection reported is from Santa Maria in Santa Barbara County.

Range. Coastal southern California and Baja California.

Representative specimens. California. Riverside County: Temecula Valley, *Mason 3200.* San Diego County: 2 miles south of Pala, *Mason 3133;* San Diego, May, 1906, *K. Brandegee;* Cuyamaca, July, 1894, *T. S. Brandegee;* Mt. Helix, *Rose 35260;* Granite, *Spencer 66.* Baja California. Ryersons Ranch, June, 1893, *T. S. Brandegee;* Llano de Satana, May, 1889, *T. S. Brandegee;* Tiajuana, May, 1883, *Orcutt.*

9. **Eriastrum Wilcoxii** (Nelson) comb. nov. *Gilia floccosa* Gray, emend. Syn. Fl. N. A. 2: 143. 1878, not type of *G. floccosa* Gray, Proc. Am. Acad. Sci. 8: 272. 1873 (see discussion under *Eriastrum luteum*). *Gilia Wilcoxii* Nelson, Bot. Gaz. 34: 27. 1902. *Welwitschia Wilcoxii* Rydb. Fl. Rocky Mountains 688. 1917. *Huegelia filifolia* var. *floccosa* Jepson, Fl. Calif. 3: 166. 1943, as to lectotype, not as to type.

Eriastrum Wilcoxii is the species most often under consideration under the various combinations of *Gilia floccosa* Gray of authors. The following are to be referred to it as to text but not as to type. All are here regarded as type synonyms of *Eriastrum luteum* (Benth.) Mason; hence they are not complete synonyms of *E. Wilcoxii* (Nels.) Mason.

Gilia floccosa Gray, Proc. Am. Acad. Sci. 8: 272. 1873, in part as to text, not as to type. *Huegelia floccosa* (Gray) Howell, Fl. N.W. Am. 458. 1903. *Gilia virgata* var. *floccosa* (Gray) Milkn. Univ. Calif. Publ. Bot. 2: 40. 1904. *Navarretia floccosa* (Gray) Kuntze, Rev. Gen. 2: 433. 1891, in part (since it was based on original *Gilia floccosa* Gray). *Navarretia virgata* subsp. *floccosa* (Gray) Brand in Engler, Pflanzenreich 4^{250}: 168. 1907. *Welwitschia floccosa* (Gray) Rydb. Fl. Rocky Mountains 688. 1917. *Huegelia virgata* var. *floccosa* (Gray) Jepson, Man. Fl. Pl. Calif. 793. 1925. For a discussion of the nomenclatural problem involved here see under *Eriastrum luteum*, pp. 81–83.

Eriastrum Wilcoxii is the common member of this genus in the Great Basin area. The type came from St. Anthony, Idaho.

The occurrence of this species in the La Panza Range, San Luis Obispo County, California (*Gifford 830*), is not an inconsistent distribution for a Great Basin species. The La Panza Range is just to the west of the Temblor Range with the Cholame Valley intervening. The McKittrick flora (17) of Pleistocene age gives positive evidence of a pinyon-juniper association in the Temblor Range at that time. This is a typical Great Basin association and relics of it still persist in Santa Barbara Canyon just to the south. The chief difference between this and the Great Basin plants rests in the fact that this specimen seems to have the seeds solitary in the locules. The Duran collection from the White Mountains has in many of the locules only one ovule, but I have found none in which all the locules were uniovulate. It is of interest to note in such cases that the single ovule fills the locule and hence is of a very different shape and size from those developing in multiovulate locules.

Range. Eastern Washington to Idaho and Utah, south through Oregon to the Panamint Mountains of California; known west of the Sierra-Cascade ranges only in the La Panza Range of San Luis Obispo County, California.

Representative specimens. WASHINGTON. Washington Territory, *Canby 966*. Douglas County: junction of Crab and Wilson creeks, *Sandberg & Leiberg 246*. IDAHO. Canyon County: Nampa,

Macbride 1069. Elmore County: King Hill, *Nelson & Macbride 1093.* Custer County: Challis, *Macbride & Payson 3213.* Blaine County: *Macbride & Payson 2984.* Oregon. Devine Ranch, *Leiberg 2408.* Harney County: Steens Peak, *Peck 19004.* Utah. Juab County: 2 miles east of Troutcreek, *Maguire & Becraft 2746.* Nevada. Washoe County: north of Wadsworth, *Archer 6202.* Douglas County: west side Carson Valley, *Mason 12361;* Kingsbury Grade, *Mason 12169.* Ormsby County: Empire City, *Jones 3969;* Kings Canyon, *Baker 1234.* Esmeralda County: *Shockley, U. C. 134018.* Elko County: northwest of Halleck, *Pennell & Schaeffer 23391;* Deeth, *Pennell & Schaeffer 23420.* Nye County: 1 mile from Dieringer, *Goodner & Henning 695.* Mineral County: Wassuk Range, *Archer 6997;* 2 miles south of Hawthorne, *Archer 6801.* California. Nevada County: near Boca, July, 1888, *Sonne.* Mono County: Casa Diablo Mountains, *Alexander 1820;* Paoha Island, Mono Lake, *Gifford 867;* Sherwin Hill, *Peirson 10717;* Mono Mills, *Abrams & Keck 2883.* Inyo County: White Mountains, *Duran 1690, 2531, 2681;* Sierra Nevada southwest of Olancha, *Alexander & Kellogg 2951;* Westgard Pass, *Keck 537;* Panamint Mountains, July 7, 1937, *Epling.* San Luis Obispo County: Black Mountain, La Panza Range, *Gifford 830.*

10. **Eriastrum sparsiflorum** (Eastwood) comb. nov. *Gilia sparsiflora* Eastw. Proc. Calif. Acad. Sci., ser. 3, 2: 291. 1902. *Navarretia filifolia* subsp. *sparsiflora* Brand in Engler, Pflanzenreich 4^{250}: 167. 1907. *Gilia filifolia* var. *sparsiflora* Macbr. Contr. Gray Herb. 49: 57. 1917. *Huegelia filifolia* var. *sparsiflora* Jepson, Man. Fl. Pl. Calif. 792. 1925.

The present treatment of *Eriastrum sparsiflorum* and *E. Wilcoxii* represents somewhat of a departure from the usual in that they are here regarded as distinct from one another as well as from *E. filifolium.* Examination of *E. filifolium* from coastal southern California will, I think, clearly demonstrate that it is amply distinct from these entities in its delicate filiform leaves, the long exserted stamens, the very long filaments, the proportion of the corolla parts, as well as in its complete geographical isolation.

Superficially some specimens of *E. sparsiflorum* and *E. Wilcoxii* resemble one another, but if one takes the pains to dissect flowers and measure minute details and add these findings to observations of a grosser nature, a combination of characters will be found that will enable them always to be distinguished. The proportion of the tube, throat, and lobes of the corolla, stamen length (see ideographs, pl. 7), number of flowers to a head, the aggregation of heads, pattern of branching and leaf elaboration will provide a basis for differentiation. *E. sparsiflorum* and *E. Wilcoxii* are, however, much more closely related to one another than to any other species.

Several collectors have found these species growing together

and have made a point of reporting no intergradation. This lack of hybridization would seem important evidence for retaining them separate. Such a colony is represented by Mason 12361 and 12362. No significant intergradation or hybridization was noted.

Craig (5), who regarded these two entities as distinct from one another, nevertheless cites a list of specimens which he believes intergrade. Careful study of the specimens cited in this list shows that Craig's conclusions resulted from predominant use of leaf characters to differentiate the two. On the basis of stamen character and the relative length of the corolla throat every one of these "intermediate" specimens, save the Brandegee collection from Lake County, can be placed in *E. sparsiflorum* or in *E. Wilcoxii*. The Brandegee collection does not belong with either of these entities. Collections from Idaho cited by Craig as intergrading are not unlike typical *E. Wilcoxii* from St. Anthony, Idaho, the type locality. All are small specimens, hence do not exhibit the characteristic corymbose branching of *E. Wilcoxii*. However, there is a suggestion of it on the larger individuals. I have as yet seen no material from either Washington or Idaho that I would include in *E. sparsiflorum*.

Range. East base of Cascades and Sierra Nevada, Tehachapi Mountains, and north on the west slope of the Sierra Nevada to Fresno County, California.

Representative specimens. OREGON. Bend, *E. Nelson 861;* Crooked River, 1925, *Gorman;* Desert Well, *Leiberg 387;* Anderson Valley, *Leiberg 2385*. NEVADA. Douglas County: Glenbrook, *Rose 35509;* Zephyr Cove, 1936, *Miller;* Mottsville, *Mason 12362*. CALIFORNIA. Ventura County: Mt. Pinos, *Hall 6580, Dudley & Lamb 4685*.

11. **Eriastrum Tracyi** sp. nov. Annua erecta et tenuia, 1–2 dm. alta; stipites simplices vel racemose ramosi; omnino arachnoide flocculentes; folia inferiora simplicia, superiora 3-scissa super basim, segmenta linearia-filiformia; flores in capitibus terminalibus congesti, saepe capites plures ad extremitates ramorum aggregata, dense sed laxe arachnoide lanata; bracteae 3- usque ad 5-scissae ex basi lata, saepe cum membrana brevi in sinibus, infra arachnoide lanatae, super glabrescentes; calyx profunde in segmentis inaequalibus subaequalibusve 6–8 mm. longis scissus, dense arachnoide floccosis-lanatis, sinus cum membrana hyalina circa semicompleti; corolla 8–9 mm. longa, subhypocrateriformis, coerulea clara usque ad alba, tubus 5 mm. longus, fauces 1 mm. longae, lobae 2–3 mm. longae; stamina faucium ad basim affixa, circa 0.75 mm. longa, filamentae 0.5 mm. longae, antherae 0.5 mm. longae, ovales, versatiles; pistillum longitudine circa longitudinis tubi corollae dimidium; capsula 5 mm. longa, 2–2.5 mm. lata, oblonge ellipsoidea; semina 1 usque ad 2 in loculo.

Erect slender annuals 1–2 dm. high; stems simple or race-

mosely branched; lightly arachnoid flocculent throughout; lower leaves simple, upper 3-cleft above base, segments linear filiform; flowers congested in terminal heads, often several heads aggregated at ends of branches, densely but loosely arachnoid lanate; bracts 3 to 5 cleft from a broad base, often with a short membrane in the sinuses, arachnoid lanate below, becoming glabrate above; calyx deeply cleft into unequal or subequal segments 6–8 mm. long, densely arachnoid floccose lanate, sinuses about half-filled with a hyaline membrane; corolla 8–9 mm. long, subsalverform, light blue to white, tube 5 mm. long, throat 1 mm. long, lobes 2–3 mm. long; stamens inserted at base of throat, about 0.75 mm. long, filaments 0.5 mm. long, anthers 0.5 mm. long oval, versatile; pistil about one-half the corolla tube in length; capsule 5 mm. long, 2–2.5 mm. wide, oblong ellipsoid; seeds 1 to 2 to a locule.

Type. Hayfork Valley, Trinity County, California, altitude 2600 feet, June 30, 1923, *J. P. Tracy 6463* (type, Herb. Univ. Calif. no. 690662).

Range. Known only from Trinity County, California.

This species superficially resembles both *E. Brandegeae* and *E. filifolium,* from which it can be distinguished by its racemose rather than virgate or corymbose branching, its very small anthers, and the proportions of the parts of the corolla. Its capsule is much broader in proportion to length than is that of *E. filifolium.* The fact that these three entities have hitherto remained undifferentiated despite the corolla and stamen characters is an excellent example of the dangers of allowing superficial characters to influence judgment and points to the need of close examination of flower parts when dealing with *Eriastrum.* It is possible that future experimental study may produce evidence to warrant subspecific grouping of these species but at present due to their geographic isolation, no such evidence exists.

12. **Eriastrum Brandegeae** sp. nov. Annuum erectum, caulis ramosus, corymbosus, virgatusque, 5–30 cm. altum, folia tripartita in divisionibus linearibus filiformibus super basi, leviter flocculosum; flores sessiles in capitibus obovatis floccosis arachnoideis; bracteae 3 ad 5 lobatae, capita excedentes; calyx 7–10 mm. longus, profunde in divisionis inequalibus linearibus tenuibusque fissus, dense arachnoideus, sinus cum membrana angusta et rugata semiimpletus vel amplius; corolla hypocrateriformis, circa 10 mm. longa, alba usque ad coerulea pallida; tubus 4–5 mm. longus, fauces 2 mm. longi, lobi 3 mm. longi, tubus et fauces simul quam calyx brevior; stamina faucium ad basim affixa, 1–2 mm. longa, inequales, inclusa, filamentes quam antherae bis longa, antherae cordate sagitattae; pistillum 4–5 mm. longum, inclusum; capsula cum laeteribus tribus, elliptica in lineamento 4 mm. longa et 2 mm. latus, quam calyx brevior; semina solitaria in loculis, loculi raro 2-ovulati, sub aqua mucilaginosa.

Erect annual 5–30 cm. high, branching virgately corymbose paniculate; leaves 3-parted into linear filiform divisions from above the base, lightly flocculent; flowers sessile in densely arachnoid floccose obovoid heads; bracts 3- to 5-lobed, exceeding heads; heads 1 to 3 at ends of branches; calyx deeply cleft into unequal linear acerose divisions, 7–10 mm. long, densely arachnoid, sinuses over half-filled with a narrow plaited membrane; corolla subsalverform, about 10 mm. long, white to pale blue, tube 4–5 mm. long, throat 2 mm. long, lobes 3 mm. long, tube and throat together shorter than calyx; stamens inserted at base of throat, 1–2 mm. long, unequal to subequal, filaments two times anthers, anthers cordate sagittate, 0.5 mm. long; pistil 4–5 mm. long, included, capsule 3-sided, elliptic in outline, 4 mm. long by 2 mm. wide, shorter than the calyx; seed solitary in locules, only rarely locules 2-ovuled, mucilaginous when wetted.

Type. Ridge southeast of Borax Lake, Lake County, California, June 28, 1945, *Mason 12604* (Herb. Univ. Calif. no. 693854). Other collections. Lake County: between Burns Valley and Borax Lake, *Hoover 3553;* Snow Mountain, August, 1892, *K. Brandegee;* 1½ miles south of Kelseyville, *Schulthess.*

Range. Known only from the mountains of Lake County, California, and isolated geographically from both of the above.

The plant superficially resembles *E. filifolium* (Nutt.) Mason but can be readily distinguished by its more abundant but less compact flocculence in the inflorescence, its normally five-lobed instead of three-lobed bracts, its shorter and unequal wholly included stamens, its shorter and broader ovary and its one-seeded locules.

It has been identified by some with *E. sparsifolium* (Eastw.) Mason, but may be readily distinguished by its more virgate corymbose branching, unequal to subequal stamens with anthers included, cordate rather than sagittate anthers, subsalverform and shorter corolla, shorter corolla lobes and one-seeded locules of the capsule.

13. **Eriastrum Hooveri** (Jepson) comb. nov. *Huegelia Hooveri* Jepson, Fl. Calif. 3: 167. 1943.

Eriastrum Hooveri superficially resembles both *E. filifolium* and *E. Brandegeae* but differs markedly from these two in flower and seed characters.

Range. Rolling plains bordering the southern San Joaquin Valley.

Representative specimens. Fresno County: Raisin City, *Hoover 2231;* 9 miles south of Kerman, *Hoover 2329;* Little Panoche Creek, *Lyon 948.* Kern County: 4 miles east of Shafter, *Stebbins 2105;* 7 miles south of Shafter, *Hoover 1846* (type collection); Oildale, *Hoover 4081.*

14. **Eriastrum Abramsii** (Elmer) comb. nov. *Navarretia Abramsii* Elmer, Bot. Gaz. 41: 314. 1906. *Huegelia Abramsii* Jepson and Bailey in Jepson, Fl. Calif. 3: 167. 1943.

Considerable concern has been expressed as to Elmer's (6) inclusion of *Eriastrum Abramsii* in *Navarretia*. Elmer may have been impressed by the small anthers or he may have agreed with Kuntze (14) in the page priority of *Navarretia* over *Gilia*. It is, however, in no sense a *Navarretia*. Its relationships are wholly within *Eriastrum* as is testified by its simple pinnate leaves and bracts, and densely arachnoid lanate heads.

Range. This species is most abundant in the Mount Hamilton Range, but it ranges from the east face of the Santa Cruz Mountains in Santa Clara County north to Lake County, and south to San Benito County. It is always found in chaparral and often on serpentine or ferro-magnesium rock of Jurassic Age.

Representative specimens. San Benito County. Call Mountains, *Lyon 1561*. Santa Clara County. Santa Cruz Mountains: Black Mountain, *Elmer 4586, Pendleton 1473, Dudley* in 1903; Emerald Lake, *Rose 37658*. Mt. Hamilton Range: chaparral above Arroyo Bayo Creek, *Mason 8302, Sharsmith 1982;* between Arroyo Mocho and Colorado Canyon, *Mason 8313;* Santa Isabella Creek, *Sharsmith 1160;* Seeboy Ridge, *Sharsmith 3738;* Arroyo Bayo and San Antonio Valley, *Sharsmith 3307;* Arroyo Mocho, *Sharsmith 951;* head of Colorado Creek, *Sharsmith 3184*. Stanislaus County. Mt. Hamilton Range: Arroyo del Puerto, *Sharsmith 1816*. Lake County. Between Lower Lake and Knoxville, 1935, *Mason;* Coldstream, 1884, *K. Brandegee;* between Burns Valley and Borax Lake, *Hoover 3554;* 2½ miles south of Kelseyville, *Mason 12606*.

Department of Botany,
University of California, Berkeley.

Literature Cited

1. Bentham, G. In Lindley, Bot. Reg. 19: *sub* t. 1622. 1833.
2. ————. Polemoniaceae in DeCandolle, Prodromus 9: 302–322. 1845.
3. ————. Polemoniaceae in Bentham and Hooker, Genera plantarum 2: 820–824. 1876.
4. Brand, A. Polemoniaceae in Engler, Das Pflanzenreich 4[250]: 1–203. 1907.
5. Craig, T. A revision of the subgenus Hugelia of the genus Gilia (Polemoniaceae). Bull. Torrey Bot. Club 61: 385–396. 1934.
6. Elmer, A. D. E. New and noteworthy western plants. III. Bot. Gaz. 41: 309–326. 1906.
7. Gray, A. Revision of North American Polemoniaceae. Proc. Am. Acad. Sci. 8: 247–282. 1870.
8. ————. Synoptical flora of North America. 1878.
9. ————. Synoptical flora of North America, ed. 2. 1886.
10. Howell, T. A flora of Northwest America. 1903.
11. Jepson, W. L. Manual of the flowering plants of California. 1925.
12. ————. Flora of California 3(2): 160–168. 1943.
13. Kellogg, A. Description of two new species of Collomia from Nevada Territory. Proc. Calif. Acad. Sci. 3: 17–19. 1863.
14. Kuntze, O. Polemoniaceae in Revisio generum plantarum 2: 432–434. 1891.

15. Lindley, J. New plants, etc., from the Society's garden. Jour. Hort. Soc. 3: 73–80. 1848.
16. Macbride, J. F. Notes on the Hydrophyllaceae and a few other North American spermatophytes. Contr. Gray Herb. 49: 23–59. 1917.
17. Mason, H. L. A Pleistocene flora from the McKittrick asphalt deposits of California. Proc. Calif. Acad. Sci., ser. 4, 25: 221–234. 1944.
18. Sharsmith, H. K. Notes on Navarretia Abramsii of the Polemoniaceae. Am. Midland Nat. 32: 510–512. 1944.
19. Steudel, E. Nomenclator botanicus, ed. 2, pt. 1. 1840.

A NEW ARGYTHAMNIA FROM TEXAS

Victor L. Cory

I recall with pleasure a field trip made in June of 1935 with Dr. P. A. Munz, then of Pomona College, Claremont, California. Dr. Munz and his family were traveling overland from California en route to the Gray Herbarium, and we planned a field trip to San Antonio from my headquarters at the Ranch Experiment Station situated midway between the towns of Sonora and Rocksprings in the central portion of the Edwards Plateau. At San Antonio we would visit my co-worker, Mr. H. B. Parks of the State Apicultural Laboratory, and have him join us and lead us on a field trip to the Carrizo Sands and to Sutherland Springs in Wilson County. On this trip, we took occasion, also, to visit for the first time the Mustang Desert, which covers much of Atascosa, Frio, La Salle, McMullen, Dimmit and Zavala counties. It is a great rolling plain covered with cacti, low brush and large areas of salt plant (*Varilla texana*), the latter plant having attracted, in the past, hundreds of wild horses, mustangs, to this desert-like country. The animals were said to be the wild descendants of Spanish horses augmented by strays from Fort Ewell. A writer in 1850 tells of the young men of the country having an annual spring hunt to capture good colts for riding animals, and, as late as 1880, settlers along the edge of the desert reported small herds of wild horses. The Spanish Trail came into the Mustang Desert from the west and about the middle turned north to San Antonio. In 1935 the road between Cotulla and Fowlerton, La Salle County, passed three or four miles south of Los Angeles, a village situated outside the Mustang Desert and directly north of its western edge. This old road was closed a few years later, when a new state highway was made which passes through Los Angeles and skirts the northern side of the Mustang Desert. Going east and at three miles inside this area, which is carpeted with curly mesquite grass (*Hilaria Belangeri*), some interesting plants were collected. Two of them we were unfamiliar with: *Varilla texana* A. Gray and *Jatropha cathartica* (Berl.) Jtn., the latter having a large, fleshy, almost globose rootstock and attractive pink flowers. In digging out the rootstocks, the pick would almost bounce back when struck into the hard, dry, adobe soil, much as if struck against concrete.

The following plant, new to us, was also new to science.

Argythamnia argyraea sp. nov. Caulibus pluribus e radice perenni, gracilibus, teretibus, 25–35 cm. altis, plerumque 1–2 mm. crassis, indumento brevi argenteo; foliis alternis, integris, basis 3-nervis, ellipticis ovatibusve, utrinque indumento brevi argenteis, ad 4 cm. longis, plerumque 5–8 mm. latis; floribus dioecis; floribus pistillatis axillaribus, solitariis, pedunculatis; pedunculis quam folio brevioribus, 2-bracteolis ca. 1–2 mm. ad calycem impositis, pro ratione crassis, 5–8 mm. longis; petalis 5, ca. 0.5 mm. latis, 2 mm. longis, acutis, costis prominente; sepalis 5, ovato-lanceolatis, ad 4 mm. longis, 2 mm. latis, intus minus dense, extus dense argenteo-pubescentibus, basi saepe viridibus glabratisve; ovario stylisque conferte brevi-villosis; capsulis profunde 3-lobis, conferte argenteo-tomentosis, ca. 5 mm. latis, 3 mm. longis; seminibus immaturis.

Stems many from a root crown, terete, slender, 25–35 cm. tall, mostly 1–2 mm. in diameter, silvery with short appressed hairs; leaves alternate, entire, 3-nerved at the bases, elliptic to ovate, silvery on both surfaces with short appressed hairs, up to 4 cm. long and mostly 5–8 mm. broad; flowers dioecious, but only fruiting specimens collected; pistillate flowers axillary, solitary, pedunculate; peduncle shorter than subtending leaf, with two bracteoles 1–2 mm. below the calyx, relatively stout, 5–8 mm. long; pistillate flowers with 5 petals, these about 0.5 mm. broad and 2 mm. long, acute, midvein prominent; sepals 5, ovate-lanceolate, up to 4 mm. long and less than half as broad, outer surface densely silvery-pubescent, the inner surface less densely so, with the basal portion frequently green and glabrate; ovary and styles densely short-villous; capsules deeply 3-lobed, densely silvery-pubescent, about 5 mm. broad and 3 mm. long; seeds immature.

Type. Near western and northern edges of Mustang Desert, nineteen miles east of Cotulla, La Salle County, Texas, June 23, 1935, *Cory 14972* (Gray Herbarium).

This species resembles *Argythamnia aphoroides* in being dioecious, but it differs from that species in its silvery pubescence, its narrower leaves, and in its smaller fruits and seeds.

I am indebted to Dr. I. M. Johnston of the Arnold Arboretum for calling to my attention the fact that this plant was undescribed, and also for suggesting the very appropriate specific name; and to Dr. Leon Croizat for checking my material as well as for valuable assistance in preparation of the Latin description. I am grateful to Mr. H. B. Parks for visiting the type locality on June 30, 1937, to collect ample material for further study, and for information concerning the Mustang Desert. The plant is still to be collected when the seeds are mature.

Texas Agricultural Experiment Station,
Substation 14, Sonora, Texas.

NOTES ON PACIFIC COAST MARINE ALGAE. III.

E. Yale Dawson

The following notes on various Rhodophyceae are intended mainly to clarify certain problems of nomenclature and distribution in connection with the preparation by the author of "A Guide to the Literature and Distribution of the Marine Algae of the Pacific Coast of North America."

Acrochaetium Thuretii (Bornet) Collins and Hervey var. **agama** (Rosenvinge) comb. nov. *Chantransia Thuretii* (Bornet) Kylin var. *agama* Rosenvinge, Mar. Alg. Denmark 1: 102. 1909. *Rhodochorton Thuretii* (Bornet) Drew var. *agama* Drew, Univ. Calif. Publ. Bot. 14: 171. 1928.

Papenfuss (6, p. 311) in his revision of the *Acrochaetium-Rhodochorton* complex has retained the name *Acrochaetium Thuretii* (Bornet) Collins and Hervey. The variety *agama* deserves, therefore, the present new combination.

Liagora californica Zeh. This species has been recorded only from the type locality, Santa Catalina Island, California. The following specimens deposited in the Herbarium of the University of California indicate a more extensive range: Point Loma, San Diego County, California, 1875, *Edward Palmer;* Guadalupe Island, Baja California, March 18, 1932, *H. W. Clark.*

Pterocladia pyramidale (Gardner) comb. nov. *Gelidium pyramidale* Gardner, Univ. Calif. Publ. Bot. 13: 273. 1927.

Some time after Gardner described this plant from tetrasporic material he discovered specimens bearing cystocarps. In an unpublished note he made the following observations, which have since been independently confirmed by the author and by Dr. C. K. Tseng. "The cystocarps are abundant, usually single and near the outer ends of ultimate pinnules. They are unilateral and open by a single ostiole at the distal end. This necessitates placing the species in the genus *Pterocladia.*"

Pikea pinnata Setchell. Specimens found in beach drift at Coronado, San Diego County, California (*Fork 317* in Herb. Univ. Calif.) extend the known range of this species southward from San Luis Obispo County, California.

De Toni (2) pointed out that the genus *Prionitis* J. Agardh (1851) is invalidated by *Prionitis* Adanson (1763) and proposed the name *Zanardinula* for the algal genus. Both De Toni and Papenfuss (5, p. 342) have made new combinations in this genus. The following are also in order:

Zanardinula mexicana (Dawson) comb. nov. *Prionitis mexicana* Dawson, A. Hancock Pac. Exped. 3: 283. 1944.

Zanardinula guaymasensis (Dawson) comb. nov. *Prionitis guaymasensis* Dawson, A. Hancock Pac. Exped. 3: 283. 1944.

Zanardinula kinoensis (Dawson) comb. nov. *Prionitis kinoensis* Dawson, A. Hancock Pac. Exped. 3: 284. 1944.

Zanardinula filiformis (Kylin) Papenfuss var. **delicatula** (Taylor) comb. nov. *Prionitis filiformis* var. *delicatula* Taylor, A. Hancock Pac. Exped. 12: 210. 1945.

Callocolax globulosis sp. nov. Frondibus parasiticus, hyalinis, 2 mm. altis, 2–3 mm. latis, irregulariter hemisphaericus, lobatis tuberculaeformibus; cystocarpiis internis, per thallis lobatis sparsis; carposporiis 7–10 μ diam.; tetrasporangiis ignotis.

Parasitic on *Callophyllis* sp.; external parts from a relatively small, central attachment to the host, colorless, irregularly hemispherical, 2–3 mm. broad, up to 2 mm. high, with crowded, rounded lobes; cystocarps internal, without ostioles, of irregular shape, scattered through the lobed plant body; carpospores 7–10 μ diam.; tetrasporangia unknown (pl. 8, figs. 3–5).

Type. Growing on a sterile, undescribed species of *Callophyllis* dredged from a depth of twelve meters off Point Loma, San Diego County, California, April 5, 1944, *Martin W. Johnson* (Herbarium of the University of California no. 690149).

The cystocarps of the present species show conclusively that it belongs to the genus *Callocolax* which was first designed to embrace the species *C. neglectus* Schmitz, parasitic on *Callophyllis laciniata* (Hudson) Kützing from the south coast of England. The only other species of this genus known from the Pacific Coast of North America is *Callocolax fungiformis* Kylin (3, p. 35) found growing on *Callophyllis edentata* Kylin near Friday Harbor, Washington. It was described from sterile material, but vegetatively is a much larger plant than *Callocolax globulosis*. Smith (7, p. 153) mentions a *Callocolax* collected in the Monterey region and refers it with reservations to *C. neglectus*. Recently he has written to me: "My material seems to be more or less like your new species."

Iridophycus californicum (J. Agardh) comb. nov. *Collinsia californica* J. Agardh, Analecta Algol., Cont. V., 79. 1899. *Iridaea californica* (J. Agardh) Kylin, Lunds Univ. Årsskr., N.F., 37(1): 23. 1941.

Kylin reexamined the two fragments in Agardh's herbarium under the name *Collinsia californica* and states (4, p. 23) that it is not unlikely that they may be the same as the plant described by Setchell and Gardner under the name *Iridophycus sanguineum*.

Plate 8. Pacific Coast Rhodophyceae. Figs. 1–2, *Rhodymeniocolax botryoidea: 1*, cystocarpic plant from type collection growing on stipe of *Rhodymenia rhizoides*. ×8. *2*, transverse sectional diagram of small cystocarpic plant from type collection. ×16. Figs. 3–5, *Callocolax globulosis: 3*, mature, cystocarpic plant from type collection growing on blade of *Callophyllis* sp. ×8. *4*, transverse sectional diagram of cystocarpic plant in fig. 3. ×16. *5*, transverse sectional view of lobe "A" of fig. 4, showing several cystocarpic cavities filled with carpospores. ×65. Figs. 6–7, *Rhodymenia pacifica: 6*, terminal portion of blade bearing tetrasporic lobules. ×3. *7*, transverse sectional view of tetrasporic lobule. ×250.

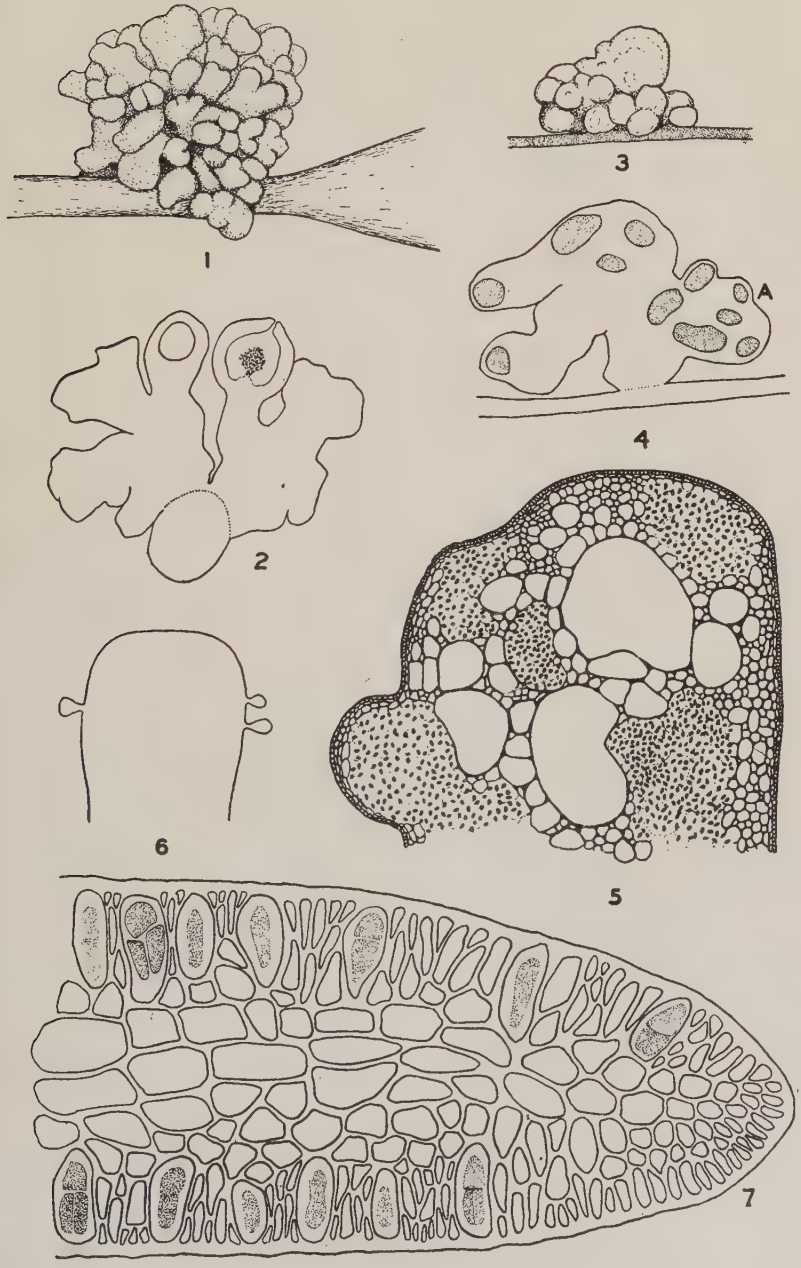

PLATE 8. PACIFIC COAST RHODOPHYCEAE.

Since he was not sufficiently certain, however, to place *I. sanguineum* in synonymy, the older name must be carried on in this new combination until the point can be settled by careful comparison of specimens. The name *Collinsia* is disposed of in any event, as De Toni has pointed out (2) that *Collinsia* J. Agardh (1899) is invalidated by *Collinsia* Nuttall (1817).

Rhodymenia pacifica Kylin, Lunds Univ. Årsskr., N.F., Avd. 2, 21(19): 21. 1925.

This species was described from sterile material collected in the lower littoral at Pacific Grove, California. Reproductive material has not been described. Although the species is not known to occur in the tidal zone in the San Diego region, specimens have been dredged from depths of ten to twelve meters off Point Loma, San Diego County, and have been found in beach drift at La Jolla. In several specimens tetrasporic lobules have been detected occurring marginally; on some, very near the apex of the broadly rounded segment (pl. 8, fig. 6) and on others, from 1 to 3 cm. below the apex. Tetraspores occur over the entire lobule on both sides and cause a nemathecial modification of the outer cell layers (pl. 8, fig. 7). According to this character of the tetrasporic sori, this species should be arranged in the section *Clinophora* of the subgenus *Eurhodymenia* (1, p. 127).

Rhodymeniocolax botryoidea Setchell, Univ. Calif. Publ. Bot. 10: 394. 1923.

This parasitic red alga has recently come to my attention in connection with its host, *Rhodymenia rhizoides* Dawson (1, p. 146). The host was originally given as *Rhodymenia palmetta* ?, and the parasite was only sketchily described in Latin without illustrations. It seems well to present here some illustrations (pl. 8, figs. 1–2) of the type material collected by N. L. Gardner at White's Point, San Pedro, California, in June, 1908. Additional material has been collected in abundance on old specimens of the host found in beach drift at La Jolla, California, throughout the winter and spring of 1944–45.

Pleonosporium squarrosum Kylin var. obovatum Gardner, Univ. Calif. Publ. Bot. 13: 414. 1927.

The type locality was not given by Gardner with the description of this plant. An examination of the type sheet (*Macoun 168*) in the Herbarium of the University of California reveals that the specimens came from Sidney, Vancouver Island, British Columbia. No date is given.

Holmesia californica (Dawson) comb. nov. *Loranthophycus californicus* Dawson, Bull. Torrey Bot. Club 71: 655–657. 1944.

Re-examination of the type specimen of *Loranthophycus californicus* Dawson and comparison with material of *Holmesia capensis* J. Agardh from South Africa in which the tetrasporangia are borne in tiny leaf-like structures on the thallus surface, have

prompted the author to abandon his earlier conclusion that the plant was a parasitic species of the Delesseriaceae. It now seems that what was thought to be a parasitic plant similar in form to *Gonimophyllum* is really the tetrasporic branchlet of the membranous "host," a species of *Holmesia*. Its original assignment to the Membranoptera group, although not as a parasitic member, is maintained. The description given of the "host" may now be considered that of the vegetative characters of *Holmesia californica*.

Scripps Institute of Oceanography,
La Jolla, California.

Literature Cited

1. Dawson, E. Y. A review of the genus Rhodymenia with descriptions of new species. Allan Hancock Pac. Exped. 3: 115–181. 1941.
2. De Toni, J. Noterelle di nomenclature algologica VII. Primo elenco di Floridee omonime. Published by the author. Brescia. 1936.
3. Kylin, H. The marine red algae in the vicinity of the Biological Station at Friday Harbor, Washington. Lunds Univ. Årsskr., N.F., Avd. 2, 21(9): 1–87. 1925.
4. ————. Californische Rhodophyceen. *Ibid.* 37(2): 1–51. 1941.
5. Papenfuss, G. F. Notes on algal nomenclature. III. Miscellaneous species of Chlorophyceae, Phaeophyceae and Rhodophyceae. Farlowia 1: 337–346. 1944.
6. ————. Review of the Acrochaetium-Rhodochorton complex of the red algae. Univ. Calif. Publ. Bot. 18: 299–334. 1945.
7. Smith, G. M. Marine algae of the Monterey Peninsula, California. Stanford University. 1944.

A NEW ASTER FROM YUKON

Arthur Cronquist

Among some specimens from Yukon recently sent to me for determination by Mr. J. P. Anderson is an *Aster* which seems unlike anything described previously from North America. With the exception of the well-known *Aster alpinus* L. and *A. sibiricus* L., the genus shows little tendency toward circumpolar distribution. There are in fact very few species of *Aster* in the far north. A survey of the more pertinent treatments of Siberian asters, such as those in Ledebour's Flora Rossica, Hultén's flora of Kamtchatka, Komarov's key to the plants of the far eastern region of the U.S.S.R., and Onno's revision of certain species supposedly related to *Aster alpinus* (Bibl. Bot. 106: 1–83. 1932), reveals nothing that might be considered allied to the plant in question. It seems proper, then, to look to the southward for its relatives. In Rydberg's flora of the Rocky Mountains it would key to *A. campestris* Nutt. Although superficially not unlike smaller forms of that species, it differs strikingly in its lax, herbaceous, equal phyllaries, as contrasted to the firm, chartaceous-based, more or less imbricate phyllaries of *A. campestris*. It also differs in its short simple caudex, instead of creeping rhizomes, as well as in

several other features. Its true affinities, as suggested by the involucre, and by the auriculate-clasping bases of the upper leaves, are with *A. modestus* Lindl. and *A. novae-angliae* L. In addition to the major differences among these three shown in the following table, *A. yukonensis* has smaller heads with fewer and shorter rays.

Table 1. Comparison of Three Species of Aster

A. yukonensis	*A. novae-angliae*	*A. modestus*
Perennial from a very short simple caudex, with some fibrous roots.	Perennial from a thickened rhizomatous caudex, with very numerous fibrous roots.	Perennial from a creeping rhizome; fibrous roots not excessively numerous.
Stems several, decumbent, 6–18 cm. tall.	Stems several, erect, 3–20 dm. tall.	Stems solitary, erect, 3–10 dm. tall.
Leaves linear or nearly so, 2–4 cm. long, 1.5–3.5 mm. wide, entire.	Leaves lanceolate, 3–10 cm. long, 6–20 mm. wide, entire.	Leaves lanceolate, 4.5–13 cm. long, 8–40 mm. wide, usually toothed.
Heads 1 or 2.	Heads several or usually numerous.	Heads several or sometimes numerous.
Involucre villous with flattened hairs, as well as glandular.	Involucre glandular, scarcely or not at all hairy.	Involucre glandular, scarcely or not at all hairy.
Outer phyllaries essentially herbaceous to the base, not chartaceous.	Phyllaries evidently chartaceous toward the base.	Outer phyllaries essentially herbaceous to the base, not chartaceous.
Known only from southwestern Yukon.	Ontario to Alabama, west to North Dakota, Wyoming, and New Mexico.	Southern Alberta and British Columbia to Oregon, Idaho, and Minnesota.

Aster yukonensis sp. nov. Herba perennis e caudice brevissimo, caulibus pluribus decumbentibus glanduloso-villosis 6–18 cm. altis, foliis linearibus sessilibus 2–4 cm. longis, 1.5–3.5 mm. latis, superioribus auriculatis subamplexicaulibus, capitulis solitariis vel 2, disco 8–13 mm. lato, involucro 7–10 mm. alto, glanduloso et villoso, bracteis linearibus herbaceis 2–3 seriatis equalibus, achaeniis obscure pauci-nervis, pappo paenissime simplici.

Perennial with a very short simple caudex and fibrous roots; stems several, decumbent, slender, purple, 6–18 dm. long, sparsely to moderately spreading-villous and more or less glandular, especially upwards; leaves linear or nearly so, about 2–4 cm. long and 1.5–3.5 mm. wide, all sessile, or the lower subpetiolate, the upper becoming auriculate-clasping, fairly numerous and equably distributed (the internodes only about 6–18 mm. long), most of them nearly or quite glabrous, the upper becoming glandular, all acute or acuminate except for some rounded-obtuse and mucronate lower ones; heads solitary or 2, the disk when pressed 9–13 mm.

wide; involucre 7–10 mm. high, glandular, sparsely to moderately villous with flattened hairs; phyllaries green, purplish above, especially on the margins, or the inner purplish throughout, acute to attenuate-acuminate, in 2 to 3 equal series; ligules about 20, blue, 10 mm. long, 2 mm. wide; disk-corollas about 5.9–6.5 mm. long, the tube 1.8–2.3 mm., the lobes 0.6–0.8 mm.; style-appendages lanceolate or lance-subulate, acute to acuminate, 0.4–0.5 mm. long; achenes obscurely several-nerved, pubescent with stiff appressed brown-based hairs; pappus of about 35–40 slightly sordid or faintly purplish bristles, with a few obscure and slender short setae visible at 50 diameters magnification.

Type. South end of Lake Kluane, southwestern Yukon, July 23, 1944, *J. P. Anderson 9384* (Herbarium of the New York Botanical Garden). An isotype is retained in Mr. Anderson's collection at Iowa State College, Ames, Iowa, and another is included in the set laid aside for the University of Lund, Sweden.

New York Botanical Garden,
New York City, New York.

TWO TIOID ASTRAGALUS NOVELTIES FROM THE ROCKY MOUNTAIN REGION[1]

C. L. Porter

Astragalus (*Tium*) racemosus Pursh var. **typicus** nom. nov. *A. racemosus* Pursh, Fl. Am. Sept. 740. 1814.

Astragalus (*Tium*) racemosus Pursh var. **Treleasei** var. nov. A var. *typicus* differt: carina in apice purpurascenta; leguminibus ovato-lanceolatis, 10–20 mm. longis et 4–7 mm. latis.

Differing from var. *typicus* in having the keel of the flowers with a prominent purple tip, and pods which are ovate-lanceolate in outline, the body 10–20 mm. long and 4–7 mm. wide.

Specimens examined. Wyoming. Uinta County: between Carter and Lyman, spring of 1940. *O. A. Beath 125* (type, Rocky Mountain Herbarium, University of Wyoming; isotype, Gray Herbarium, Harvard University); shale outcropping, bluffs of Blacks Fork River, 3 miles north of Lyman, June 10, 1937, *Reed C. Rollins 1650*. Utah. Duchesne County: on the Wasatch formation near Duchesne, June 16, 1940, *O. A. Beath G–509;* 3 miles west of Duchesne, 1941, *Sam F. Trelease H–481;* in cultivation on University of Wyoming campus (seed collected in 1940 by O. A. Beath near Duchesne), July 28, 1943, *C. L. Porter 3300*. All of these collections are deposited in the Rocky Mountain Herbarium.

It was at first thought that this novelty was merely an aberrant form of the species or possibly a hybrid, but it has been found that var. *typicus* does not occur in either of the regions where var.

[1] Contribution no. 199 from the Department of Botany and the Rocky Mountain Herbarium of the University of Wyoming, Laramie.

Treleasei is common (the former having a more eastern range), and the fact that it has been grown successfully from seed and that such plants retain the characters of the parents suggests at least varietal rank. It is a pleasure to name it for Dr. Sam F. Trelease who has not only collected the plants in the field but who has contributed much to our knowledge of seleniferous vegetation which includes many Astragali.

In this connection it is interesting to note that recent studies by Beath *et al.* (1) and by Trelease (2) indicate that the presence of selenium in significant quantities in certain species of *Astragalus*, and the corresponding lack of that element in others when growing under similar conditions, constitutes what might well be a valuable clue to taxonomic affinities. In this case, for instance, it has been found that whereas *Astragalus racemosus* var. *typicus* commonly contains from several hundred to several thousand parts per million of selenium, var. *Treleasei* has never been found to contain more than 100 parts per million, and when the two were grown under similar conditions experimentally it was found that var. *typicus* consistently contained about five times the selenium found to be present in var. *Treleasei*.

Astragalus (*Tium*) **Schmollae** sp. nov. Herba perennis, caulibus erectis, circa 5 dm. altis, striatis, purpureis inferiore viridibus superiore, ramosis a base strigosis, pilis albis planis appressis; foliis pinnatis, 5–10 cm. longis, pallenter viridibus, strigosis, foliolis plerumque 11 ad 13, oblongo-linearibus, 1–3 mm. latis, 10–30 mm. longis, apice rotunda, base paullo abrupte contracta ad petiolulam 0.5–1 mm. longam; stipulae triangulares, 1–2 mm. latae base, 1–2 mm. longae, strigosae in marginibus; flores in racemis terminalibus 5–15 cm. longae; calyx viridis, pubescente strigosa nigra, tubus circa 6 mm. longus, 3 mm. latus, dentibus lanceolatis, circa 1 mm. longis; corolla ochroleuca, circa 15 mm. longa, vexillo mediocriter arcuato; legumen coriaceum, fere rectum immaturitate sed maturitate sutura dorsali concava, sutura ventrali convexa, valve recurvescente, 25–40 mm. longum, 3–4 mm. latum, sutura sulcata dorsali, sectione transversa obcordata, absente septo interno; stipe 7–10 mm. longo, calicem excedente; semina circa 10 usque ad 15 ad legumen, reniformata.

Plants perennial, the stems apparently erect, about 5 dm. high, striate, purplish below, green above, branching from the base, strigose with flat appressed white hairs; leaves pinnate, 5–10 cm. long, pale green and strigose, the leaflets mostly 11 to 13, oblong-linear, 1–3 mm. wide and 10–30 mm. long, the apex rounded, the base rather abruptly contracted to a petiolule 0.5–1 mm. long; stipules triangular, 1–2 mm. wide at the base and 1–2 mm. long, strigose on the margins; flowers in a terminal raceme 5–15 cm. long; calyx green, with black strigose pubescence, the tube about 6 mm. long and 3 mm. wide, the teeth lanceolate, about 1 mm.

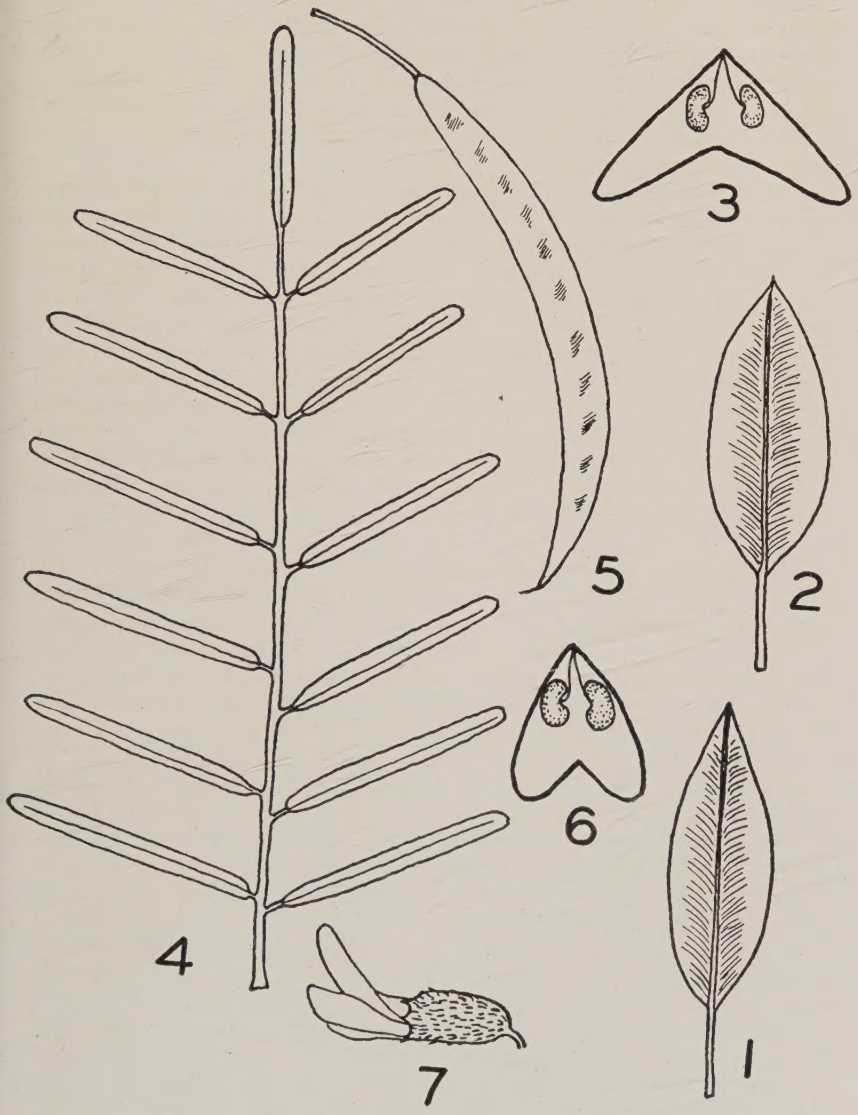

PLATE 9. ASTRAGALUS. FIGS. 1–3, *Astragalus racemosus* var. *Treleasei*: *1, 2,* pods, ×2; *3,* median cross section of pod, ×5. FIGS. 4–7, *A. Schmollae*: *4,* leaf, ×2; *5,* mature pod, ×2; *6,* median cross section of pod, ×5; *7,* flower, ×2.

long; corolla ochroleucous, about 15 mm. long, the banner moderately arched; fruit leathery, nearly straight when young but at maturity the dorsal suture concave and the ventral suture convex making the pod recurved, 25–40 mm. long and 3–4 mm. wide, sulcate on the dorsal suture, the cross section obcordate and without an internal septum; stipe 7–10 mm. long, exceeding the calyx; seeds about 10 to 15 in each pod, reniform.

Type. Northwest of Spruce Tree House, Mesa Verde National Park, Colorado, 6800 feet, May 26, 1925, *Hazel M. Schmoll & Deric Nusbaum 1555* (Rocky Mountain Herbarium no. 105889, flowers, no. 105888, fruit). Cotype. Among junipers, Mesa Verde National Park, Colorado, May 12, 1925, *A. Nelson 10420* (Rocky Mountain Herbarium).

The relationships of this species are not clear, but it appears to have the most in common with the Section *Racemosa* as defined by Rydberg. The recurved pod also suggests *Astragalus recurvus* Greene in the Section *Atrata,* but the large flowers, long stipe, and coarse nature of the plants are not in keeping with that group.

Department of Botany,
University of Wyoming, Laramie.

Literature Cited

1. Beath, O. A., C. S. Gilbert, and H. F. Eppson. Am. Jour. Bot. 26: 257–269, 296–315. 1939.
2. Trelease, Sam F., and Helen M. Trelease. *Loc. cit.* 25: 372–380. 1938.

REVIEWS

Experimental Studies on the Nature of Species. II. Plant Evolution through Amphiploidy and Autoploidy, with Examples from the Madiinae. By Jens Clausen, David D. Keck, William M. Hiesey. Carnegie Institution of Washington Publ. 564: viii + 174. 1945.

Part two of "Experimental studies on the nature of species" consists of well-documented discussions of the role of amphiploidy and autoploidy in the reticulate type of evolution that characterizes groups at or below the taxonomic level of genera and species. The documentation is chiefly of data resulting from the experimental synthesis of amphiploids. After cytogenetic investigation their interpretation follows biosystematic principles. Many experimental polyploids developed by others are reviewed and interpreted along the biosystematic pattern. The term "autoploidy" is restricted to "the multiplication of genomes within one ecospecies," while "amphiploidy" involves the addition of the genomes of two distinct species.

The authors point to the organization of living things being in a sort of equilibrium between genetic and ecologic processes. "The natural species consists of individuals whose genes are in internal balance so that a harmonious physiologic and morphologic development is assured generation after generation." The

individuals of wild species not only are balanced internally, but are in harmony with their natural environment.

A classification of hybrid auto- and amphiploids is presented based upon circumstances of origin which determine certain observable results involving such features as the loss or preservation of parental genomes, and the complete, partial, or absence of inter-genomal pairing. Plotted against these differentiae is the degree of sterility or fertility of the undoubled F_1. The fully fertile F_1 is regarded as resulting from an intra-ecospecific cross and is known only in autoploids. Where partial sterility results the cross is regarded as inter-ecospecific, and where complete sterility results, the cross is regarded as inter-cenospecific. These latter cases apply to amphiploids.

Although the reticulate nature of evolutionary relationship in the lower taxonomic categories is granted, your reviewer prefers to keep an open mind on the significance of interfertility and sterility, used in a categorical sense, to delimit or merge taxonomic entities. There is much to be learned about the nature and causes of sterility and fertility. This leads him to question the merging of the hexaploid *Madia citrogracilis* and the hexaploid *M. gracilis* on the circumstantial evidence of gene interchange in spite of the difference in origin of the two. Likewise, he maintains an open mind on the meaning of the apparent discrepancies in the classification of the grasses discussed by these authors until we can be sure that speciation in the monocotyledons follows precisely the same cytogenetic patterns as it does in dicotyledons.

The work goes a long ways toward clarifying the problems of amphiploidy and autoploidy and it is of the usual excellence of these authors.—Herbert L. Mason.

Flora of Illinois. By George Neville Jones. The University Press, Notre Dame, Indiana. Pp. 317, 1 map. 1945. $4.00.

To an already impressive list of excellent guides to the flora of limited regions of North America, Dr. Jones now adds the "Flora of Illinois," a volume deserving the whole-hearted commendation of amateur and professional botanists. The work consists of carefully constructed keys to the families, genera, and species of plants in the state of Illinois. There are no descriptions, no illustrations, and indications of range beyond state boundaries are omitted. There is no list of proposed new species, new names, or new combinations, but one finds on page 178 a new combination in *Rhus*. There is a short discussion of the flora and vegetation by regions at the beginning, and a lengthy bibliography at the end. The section of the latter dealing with taxonomic monographs and revisions, although incomplete, is perhaps the most useful bibliography of this kind which has appeared in connection with any North American flora.

The key to the families (adapted from an earlier attempt by

Hitchcock and Standley) presents an interesting departure from the usual order for such keys in that it emphasizes vegetative before floral characteristics. Such a key doubtless is useful in identifying sterile specimens, particularly of trees and shrubs, but in most cases one needs flowers to reach the family anyway. Since professional taxonomists rarely use keys to families, it must remain to amateurs and beginners to determine its usefulness. One wonders, though, how one would key such a species as *Cornus canadensis* which the author admits is an "herb or subshrub," but which must be considered a tree or a shrub before it can be placed in the proper family.

The sequence of families and their delimitation follow in general the system outlined in the eleventh edition of Engler's "Syllabus der Pflanzenfamilien," a sound procedure in a work such as the "Flora of Illinois." However, segregation of the Saxifragaceae into five families, while the Liliaceae, Rosaceae, Leguminosae, Ericaceae, and Compositae are retained intact, is hard to defend. Generic limits are essentially traditional and conservative; specific limits, less so. The author leans heavily on recent revisions and monographs but does not always follow them in their entirety, particularly when deciding the status of a given entity. Therefore, the flora cannot be trusted always to reflect the most carefully considered current opinion. Departures from accepted standard monographs and revisions in a flora of this kind should be few or accompanied by reasons.

One is tempted to compare Jones's flora with Deam's masterly "Flora of Indiana," a comparison which is not entirely fair to the younger author. The number of species admitted to the two floras is comparable, 2124 for Illinois; 2140 for Indiana. The plants of Illinois are doubtless not so well known as are those of the neighboring state, but Jones's addiction to giving specific status to entities considered as varieties by Deam (and not included in the above total), and his less rigorous criteria for the inclusion of species, tend to obscure this probability. Lengthy notes and field observations which add so much to Deam's flora are omitted entirely. Aside from those which are recognized as species, most varieties and forms (of which Deam lists 390) are ignored by Jones. Some of these omissions are justifiable in the interest of brevity, but the value of the contribution to critical botanists unquestionably has suffered thereby.

Dr. Jones, however, is to be congratulated on this successful culmination of his five-year field and herbarium study. The publication of a flora covering an area as large as the state of Illinois is always an event of major botanical importance, particularly when there has been no previous comprehensive flora of the area. This flora satisfies a real need of the individual who is interested in the flora of the state. Here he may turn and with a minimum effort determine the plants which he finds.—Marion Ownbey, State College of Washington.